the OIL AND GAS JOURNAL

JANUARY 16, 1956

Drilling Contractors Caught in Switch

p. 68

Richfield is doing a bang-up job of

Selling Conservation to Californians

p. 74

Sharon Ridge operators unitize to

Double Oil Production

p. 90

How bad is the

ENGINEER SHORTAGE?

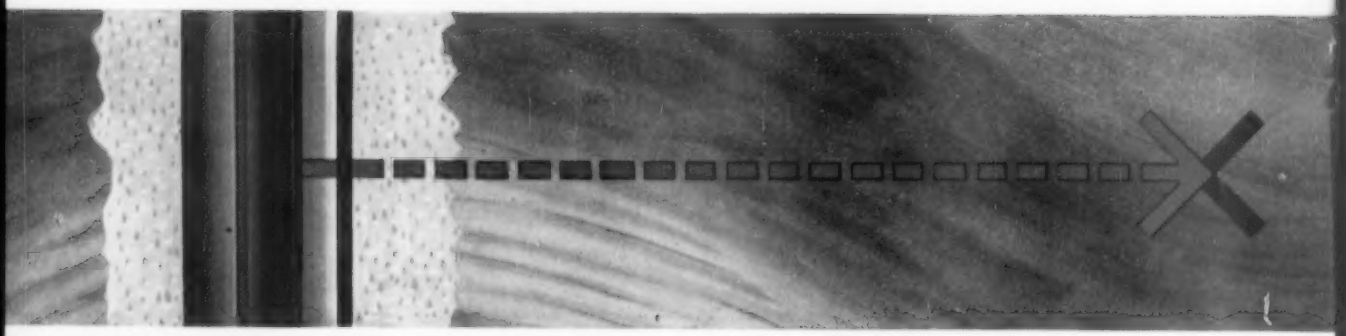
Here's the first of several articles analyzing this problem, and exploring possible solutions

p. 64

Complete table of contents and article digests on pages 2 - 3

When you want to reach

W - A - A - A - Y
OUT THERE...



When the tough jobs come along – heavy cement sheaths, dense limes, hard tight sands, acidizing and formation fracturing jobs – this powerful perforator takes them in stride. Its power drives bullets deep into the formation, creating optimum drainage channels to bring in the oil. And the E-Gun's formation fracturing power is proved by the lower breakdown pressures required when acidizing or frac jobs follow E-Gun perforating.

And with this extra power, remember, you get all the *other* extras of Lane-Wells perforating:

SELECTIVE FIRING to let you place the shots in any density your conditions require.

DEPTH MEASURE ACCURACY with Lane-Wells famous depth measuring system.

MAXIMUM SAFETY for well and crews with Lane-Wells proved "Safety-Method" procedures.

PLUS on-the-dot service by trained crews from a nearby Lane-Wells branch to cut your down-time to the absolute minimum!

Write for complete information, and remember – You get the BEST in Service when you call

LANE-WELLS "E-GUN"

is the bullet perforator that does it!

tests prove its tremendous penetration!

Tomorrow's Tools – Today!

LANE WELLS COMPANY

General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58
LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

A glance ahead . . . at press time

These trends will make TOMORROW'S NEWS

Stepped-up enforcement of antitrust, Robinson-Patman, and other business laws may be in the offing.

The Justice Department and Federal Trade Commission will ask Congress for more money this year. They are smarting under charges of soft enforcement, and congressional committees are getting restive.

Look for increased agitation by oil producers in Canada for amendment of Canada's depletion laws.

On the surface, U. S. and Canadian allowances are the same. But there's one big difference: In Canada the producer can't include exploration expenses. This, plus the fact that it takes much longer to deplete reserves in Canada, is convincing producers that 100 bbl. of production in the U. S. is a better deal than the same amount in Canada.

Despite continued talk of too much refining capacity, the trend this year is for more basic capacity for crude-oil processing.

Most of the industry's current investment is still going into units which will improve product quality. But the curve on crude capacity, which levelled off somewhat during the past 2 years, will again tilt upward for 1956—perhaps by 10 per cent.

Utilities fighting the Harris bill are finding their attacks are backfiring. State and local regulatory bodies, prompted by producer replies to inaccurate claims of distributors, are beginning to ask why distributors in many areas get all but a small part of the gas consumer's dollar. Agitation for public ownership of distribution facilities is being revived.

The Armed Services Petroleum Purchasing Agency may soon be reorganized. Now headed, in turn, by officers of the Army, Navy and Air Force, it may be placed under one of the three departments and linked more closely to logistic and strategic planning. Big question seems to be whether Navy or Air Force will be put in charge.

Conversion of the Little Big Inch to products on June 1 will bring important changes in product quotations at Texas Gulf, North Louisiana, Arkansas and Mississippi River terminals.

What happens will depend largely on pipeline rates to be. One expectation: Partial abandonment of existing product systems and barge movements in part of the general area to be served by the new system.

Look for more costly waste-disposal projects this year in the nation's refineries. Companies are pouring millions down the drain with no expectation of returns except keeping their reputation as good neighbors.

the OIL AND GAS JOURNAL

JANUARY 16, 1956 • VOLUME 54 • NUMBER 37

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

Kenneth B. Barnes — Editor
Henry D. Ralph — Chief Editorial Writer
Ted A. Armstrong — News Editor
Gerald L. Farrar — Engineering Editor
Dr. Frank J. Gardner — Exploration Editor
Paul Reed — Pipeline Editor
John C. Reidel — Petrochemical Editor
C. O. Willson — Consulting Editor
W. L. Nelson — Technical Editor
Lynn M. Nichols — Presentation Editor
John C. Casper — Economics Editor
Neil Williams — Associate Editor
Norman S. Morrisey — Drilling-Development Editor
Robert G. Deering — Associate Pipeline Editor
R. B. Tuttle — Equipment Editor
W. A. Franklin — Assistant to Presentation Editor
Carl Hoot — District Editor
Carl J. Lawrence — District Editor
John C. McCaslin — District Editor
John M. McGivern — District Editor
W. A. Bachman — District Editor
Gene T. Kinney — District Editor
J. O. Scott — District Editor
LaWanda Turner — Readership Research
Helen Brown — Editorial Assistant
Alice Burt — Editorial Assistant
Aileen Cantrell — Editorial Assistant
C. Dudley Johnston — Art Director
Jo Jeanne Speaker — Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber — Refining Editor
Paul Swain — International Editor
Ray G. Gibson — District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726

F. Lawrence Resen — District Editor
Edwin McGhee — District Editor
Joe Reilly — District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone STerling 3074

Robert J. Enright — District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont — District Editor
William T. Smith — District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz — District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; and Casper, Wyo.

The Oil and Gas Journal, Published Mondays, copyright 1955, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

IN THE NEWS

Of General Interest:

An Executive Discusses the Shortage of Scientists 64
Knight Dangles Glittering Bait Before Oil Workers 67
Atlantic Buying Houston Through an Intermediate 72
Richfield Selling Conservation to Californians 74
Gulf Purchase of Warren Is Detailed 83

Pipelining:

SoPac Expanding System to Feed Air Bases 66
Natural Gas Finally Starts Flowing to Minot 71
New Life Breathed into West Coast Pipeline 76
Transco Plans Another Year of Expansion 80
New Welding Processes Studied for Pipelining 82
T.G.T. Plans 200-mile L.P.G. Line to Houston 83

Refining:

Cosden Unifining Unit Goes on Stream 69
What Gulf Refiners Are Thinking 70
Corpus Christi Refinery to Be Expanded 71
Waterfalls Installed at Tide Water Refinery 78
Auto Changes Coming, Just What Is Uncertain 80
El Paso Natural Speeds up Shift to Refining 84

Government:

Senate May Come to Grips With Harris Bill This Week 67
Refuge Leasing Spreads into Full-Scale Fight 76
New Attacks Leveled at Rubber-Plant Sales 82

Drilling:

Drillers Squeezed by High Costs, Lower Incomes 68
Deepest Well Runs into New Trouble 86

Exploration:

Thirteen Firms to Start Libyan Search 87
Turkey Grants Licenses to Seven Operators 88
Limits of Egypt's Belayim Field Extended 88
Cuban Wildcat Picks up Promising Shows 89
Year Opens With Bang in North Dakota 151
Tejon-Grapevine Field Still Busy Spot 152
Western Canada Looks Confidently Ahead 156

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY–OPERATION

Refining

Pemex Operates Modern Lube Plant at Salamanca **102**

By John C. Reidel

The $3,000,000 plant combines high-vacuum distillation, two-stage propane deasphalting, two-stage furfural solvent extraction, and three-stage solvent dewaxing. It was built using latest design features, and has a high degree of instrumentation.

Shell Operates New $55,000,000 Plant in Australia **119**

The 32,000-bbl. refinery is fed by tanker with crudes from British Borneo and the Middle East. A products pipeline connects the refinery with Melbourne.

The Foreman's Page **121**

Refiner's Notebook **123-124**

Questions on Technology **127**

Drilling—Production

Sharon Ridge Operators Will Double Oil Production by Flooding **90**

By T. M. Ocheltree

Sharon Ridge Canyon Operators in Scurry County, Texas, have unitized to implement pressure-maintenance operations designed to recover an estimated 115 per cent more oil from the Canyon Reef limestone. Ultimate water injection will be 75,000 bbl. per day.

Air-Gas Drilling Is Faster and Cheaper **99**

By Fred R. Nelson and Norman S. Morrissey

Air and gas drilling can reduce drilling cost 75 per cent under favorable conditions. Mud bills and drilling time can be reduced in certain areas. Continental has cut drilling time from 19 to 2½ days by using air drilling in South Little Buck Creek field of Wyoming.

Pipelining

Pipeline Pulsation Control—2 **113**

By James M. Sharp and Edward N. Henderson

This article tells how the electric analog is used, what data it will give, and how those data are applied in designing a compressor installation.

How to do a Better Job of Inspecting Coatings **133**

By Pearce R. Butterfield

Here are tips on cleaning and priming, the actual coating, and prevention of holidays. Information is also given on valves and casings, test leads and insulating flanges. —Other items.

Exploration

Australia Still Looking for Second Field **95**

By W. D. Mott

Most states in the continent down under are involved in the intensive search to find another field. Some 33 wells have been completed in the past 20 months.

General Interest

Want to Improve Your Reading? **111**

By Dr. Nila Banton Smith

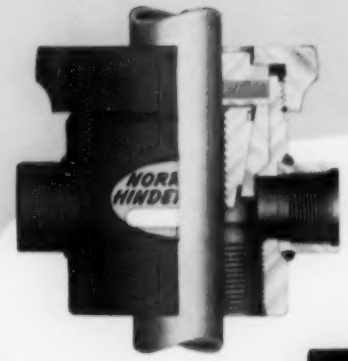
Here are two ways to improve words per minute and comprehension. There are tips on how to read paragraphs and pointers on how to read and recall details.

DEPARTMENTS

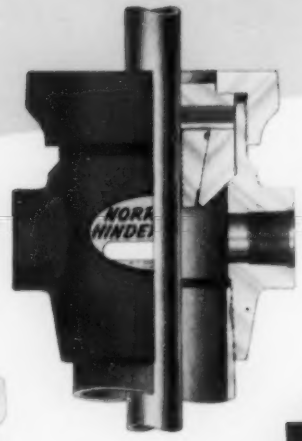
A Glance Ahead	1	Engineering Reference Section	121-127	Personals	171
They Say	49	Drilling Contractors	129	Statistical Summary	174
Calendar of Events	53	Pipeline Patrol	133	Drilling Statistics	175
Journally Speaking	59	Books	135	Supply Statistics	176
Editorial	61	Equipment Digest	137	Refining Statistics	177
This Week	63	Trade Literature	144	Markets	178
Watching Washington	73	Equipment Men in News	148	Classified Advertising	179
International News	87	Exploration Highlights	154	Advertisers' Index	183

FIRST IN THE FIELD!

Take time to compare...

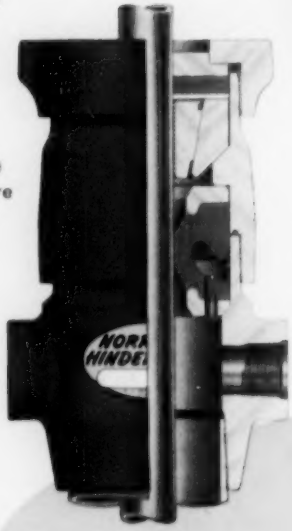


WCN
TUBING HEAD
2000# Test Pressure
1000# C.W.P.



HW 2-in-1
TUBING HEAD
4000# Test Pressure
2000# C.W.P.

HW 4-in-1
TUBING HEAD
4000# Test Pressure
2000# C.W.P.



YLS
CASING HEAD
2000# Test Pressure
1000# C.W.P.

Your SUPPLY STORE IS OUR DISTRIBUTOR
ASSOCIATION OF WELL HEAD CERTIFIED Approved MANUFACTURERS
OFFICIAL SEAL

and you will choose

NORRIS-HINDERLITER WELL HEAD EQUIPMENT

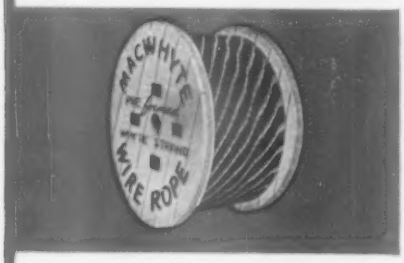
W.C. NORRIS MANUFACTURER, INC.

TULSA, OKLAHOMA

BRANCHES:
GREAT BEND, KANSAS; CORPUS CHRISTI, HOUSTON, KILGORE, ODESSA, WICHITA FALLS, TEXAS;
OKLAHOMA CITY, OKLAHOMA
SALEM, ILLINOIS; CASPER, WYOMING;
EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY

Since NORRIS 1882

WEST COAST DIST.: REPUBLIC SUPPLY CO. OF CALIF., LOS ANGELES



Prompt Service

SLINGS · WIRE ROPE · ASSEMBLIES

Your wire rope needs, whether they be for Round-Braided Slings, Cable Assemblies, or Wire Rope, are given prompt service by Macwhyte Company distributors.

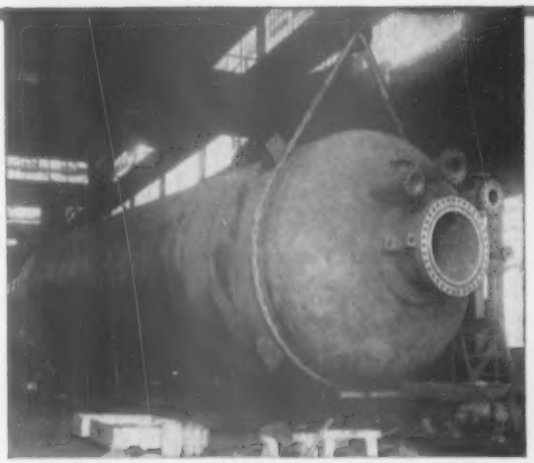
Macwhyte manufactures a wide variety of sizes and types to provide materials best suited to your needs.

MACWHYTE

SLINGS • WIRE ROPE • ASSEMBLIES

Macwhyte Company, 2916 Fourteenth Avenue
Kenosha, Wisconsin

Mill depots: New York 4, 35 Water Street
Pittsburgh 19, 704 Second Avenue
Chicago 6, 228 So. Desplaines Street
St. Paul 14, 2356 Hampden Avenue
Ft. Worth 1, P. O. Box 605
Portland 9, 1603 N. W. 14th Avenue
Seattle 4, 87 Holgate Street
San Francisco 7, 188 King Street
Los Angeles 21, 2035 Sacramento

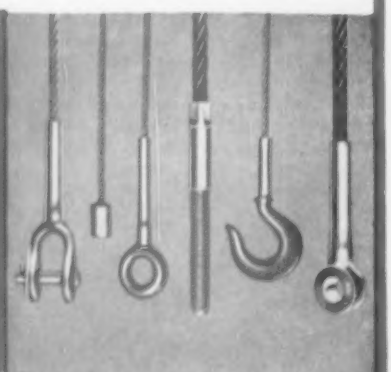


Two Macwhyte Atlas type 1 round-braided slings handling 125-ton refinery vessel.

Macwhyte Drew flat-braided slings handling 12-foot diameter, 66-ton refinery tower.

SLINGS: Macwhyte makes a wide range of sizes and types of Braided and Single-Part wire rope slings. Custom designs are made to meet special needs. For information, ask for Catalog S-8.

WIRE ROPE: There is a right rope for each equipment need. Catalog G-16 lists all classifications and sizes, also included is general information on handling and use of wire rope.



ASSEMBLIES: Macwhyte "Safe-Lock" Wire Rope Assemblies are made in a wide range of sizes, with fittings permanently attached to one or both ends. Many standard types are listed in Catalog No. 5201.

They're pumping gas to underground storage with this "Oilwell" Direct-Connected Compressor Unit

STUDY this photograph a minute! It's an "Oilwell" DGE-125 direct-connected duplex compressor unit that has just been delivered to location—ready for foundation bolts and piping connections.

It's truly a "packaged unit," even to pressure gages, controls and up-draft cooling facilities for engine and compressors, all mounted on a structural steel skid base.

Note the narrow width of these parallel compressors, powered by an in-line direct drive from the engine through right-angle, spiral-bevel gears.

In this installation . . .

. . . natural gas is being taken from low-pressure field lines, compressed and injected into underground formations which previously contained gas for storage near Zanesville, Ohio. Two 9-inch stroke compressors—one cylinder with 5½-inch diameter and the other with 3⅛-inch diameter—constitute this two-stage, duplex-type unit, which is capable of handling up to 744,000 cu. ft. of gas per day with 125 psig suction and 1,200 psig discharge at compressor speeds of 325 rpm.

Let an "Oilwell" Engineer . . . assist in the selection of the compressor for your next installation, from one of these completely packaged duplex-type units. They're available in 125, 175, 200, 250 and 300 hp sizes.

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices— CALGARY, CANADA
CASPER, WYOMING....COLUMBUS, O.
DALLAS, TEXAS....HOUSTON, TEXAS
TULSA, OKLA....LOS ANGELES, CALIF.

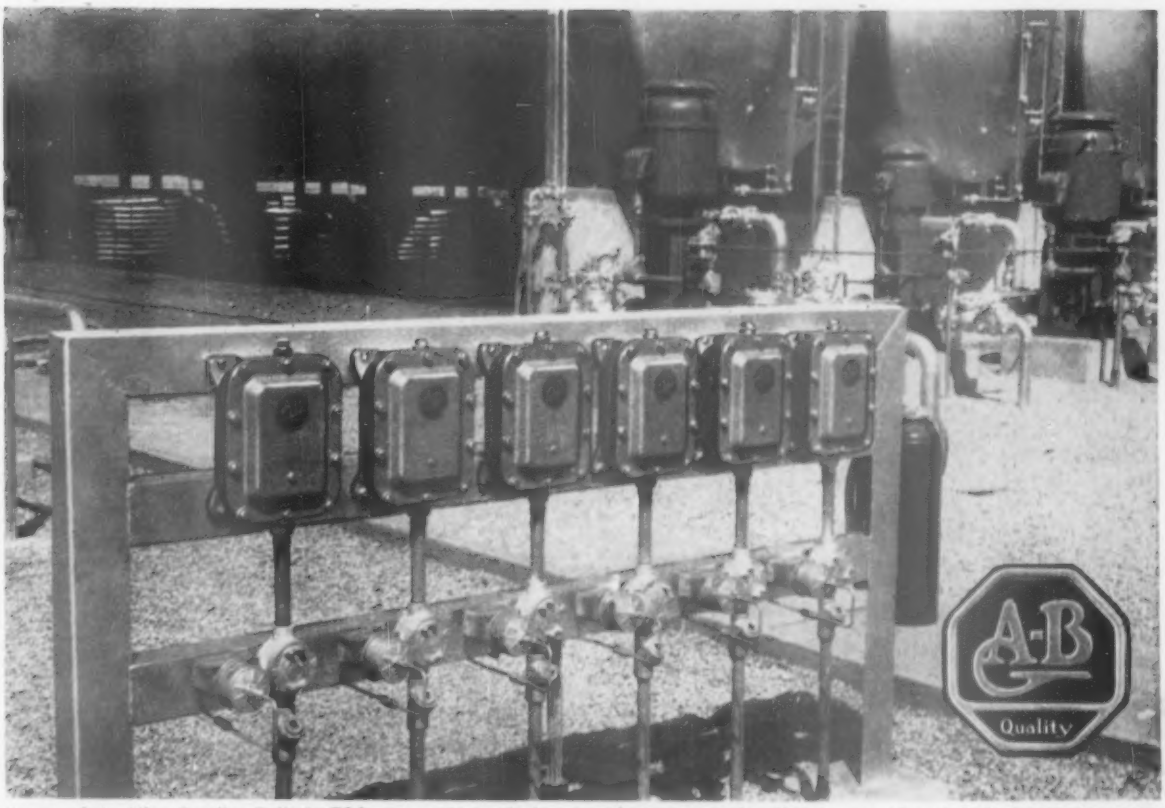
Branches Serving All Oil Fields

USS

"OILWELL"

TRADE MARK

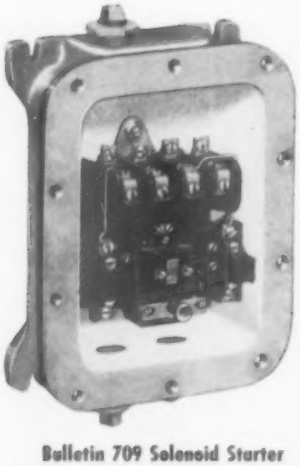
UNITED STATES STEEL



A row of six Allen-Bradley Bulletin 709 automatic explosion-proof starters on loading pumps of an L.P.G. processing plant

FOR SAFE AUTOMATIC MOTOR OPERATION

in Hazardous Locations *Specify* Allen-Bradley Explosion-proof Solenoid Starters



Bulletin 709 Solenoid Starter
Allen-Bradley Size 1 solenoid starter in a NEMA Type 7 enclosure for operation in hazardous gas locations. The cover and base have wide machined flanges.

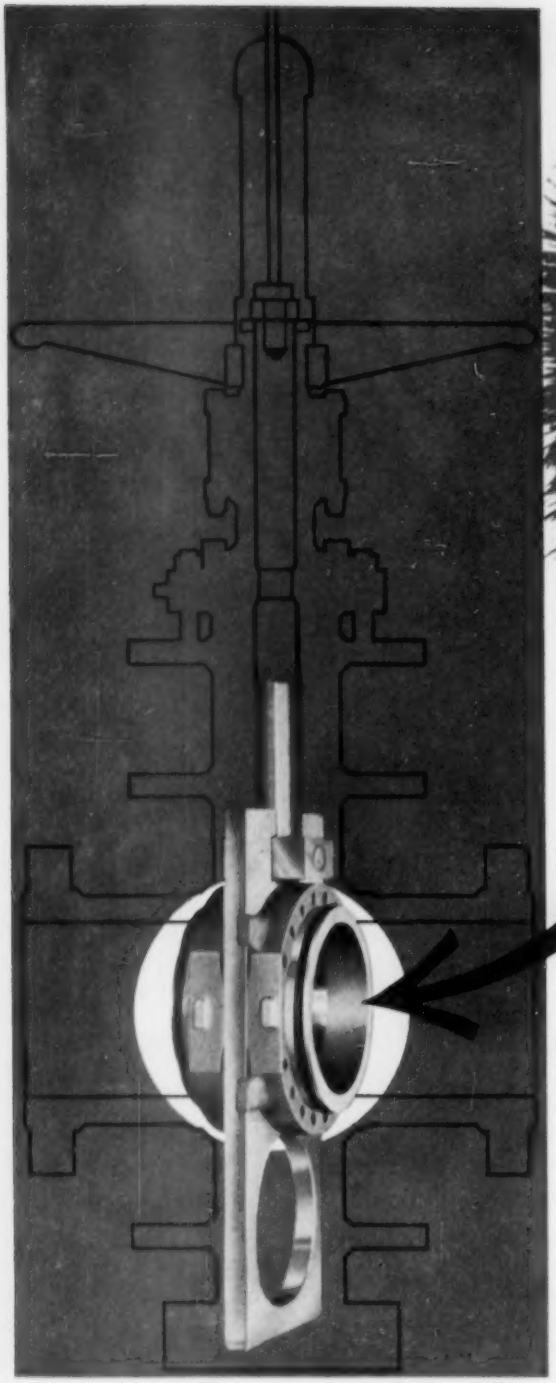
It takes a lot of maintenance time to open and replace bolted covers of explosion-proof starters. That's why it is important to specify Allen-Bradley solenoid starters . . . which are good for millions of operations without contact maintenance. The thermal overload relays can be reset without opening the enclosure.

Reduce your plant maintenance by using Bulletin 709 solenoid starters. You can install them . . . and forget them. Write for the Allen-Bradley Handy Catalog . . . a valuable guide for selecting motor controls and enclosures for every type of industrial service.

Allen-Bradley Co.
1304 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

Double Break, Silver Alloy Contacts
Arc hood lifted to show double break, silver alloy contacts on solenoid plunger and in arc hood. The basic solenoid design of all Bulletin 709 ratings is identical.



the WHOLE VALVE is RIGHT HERE

- **Line pressure is isolated in the conduit while valve is open or closed**
- **Bubble-tight seal on both sides of the gate may be checked after each operation**

Grove Seal-O-Ring Gate Valves with the exclusive new fabricated body design offer an extra wide margin of safety, because line pressure is isolated in the conduit when the gate is either full open or closed. This means that the body is required only as a framework for the simple operating mechanism, and to prevent loss of fluid or gas while gate is being moved. When gate is open or closed, body may be drained or vented to atmosphere – and integrity of both upstream and downstream seals may be checked by means of a simple tell-tale valve on the body. For 2" to 36" size requirements for all wanted working pressures.

601

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • LOS ANGELES 6 — 1930 W. Olympic Blvd.

ODESSA, TEXAS • TULSA, OKLAHOMA • DENVER, COLORADO • In Western Canada: GROVE VALVE LIMITED

GROVE SEAL RING GROVE SIMPLICITY ACCURACY SAFETY

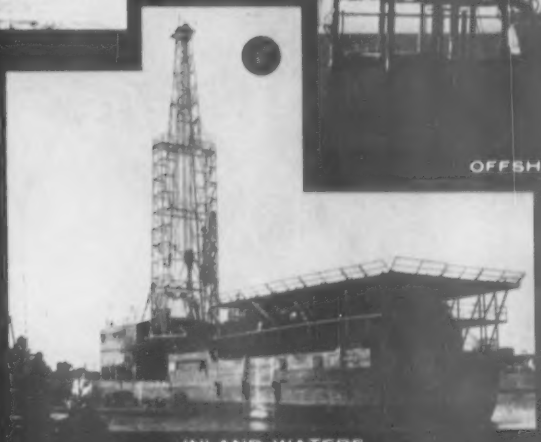
42 RIGS

MAKE HOLE *FASTER* AND *CHEAPER* IN ANY DRILLING PROGRAM

No matter what depth or location your program calls for, Penrod has the equipment, the skilled men, the experience, to offer you big savings.

ON LAND

OFFSHORE



INLAND WATERS

- MODERN EQUIPMENT – LATEST METHODS
- THOROUGHLY EXPERIENCED ORGANIZATION
- INDIVIDUAL SUPERVISION OF EACH RIG
- 2-WAY RADIO ON ALL EQUIPMENT
- MODERN HOUSING FOR OPERATING PERSONNEL
- HIGH PRESSURE PUMPS ON ALL RIGS
- USE OF MAXIMUM DRILL COLLAR WEIGHT

CALL, WIRE OR WRITE TODAY

PENROD DRILLING COMPANY

D. K. (DEWEY) DAVIS, DRILLING SUPERINTENDENT

TELEPHONE 3-1601

418 MARKET STREET — SHREVEPORT, LOUISIANA

ROTARY VALVE DRIVES

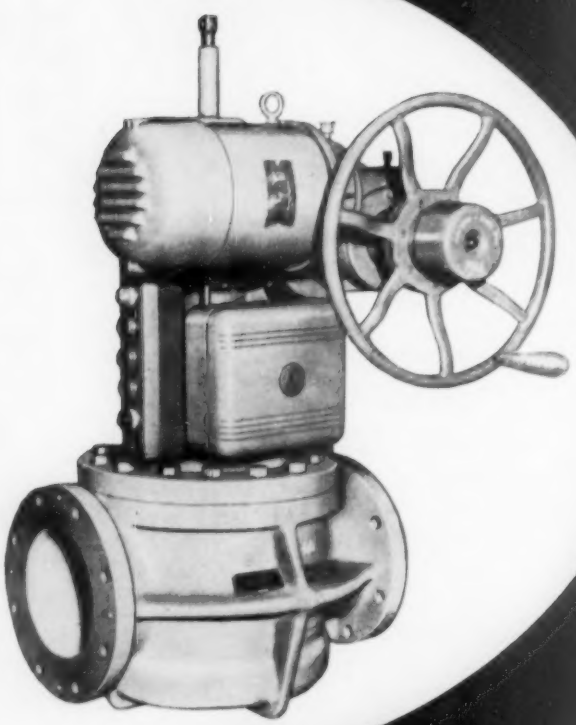
by

Janette

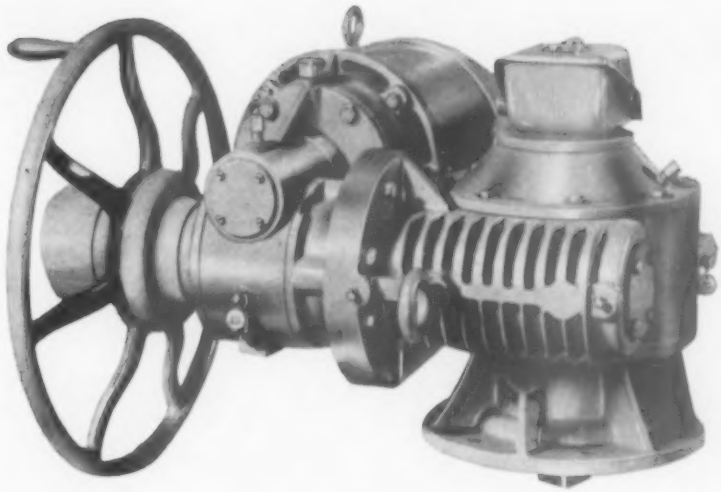
"ALL IN ONE – BUILT BY ONE"

Incorporating all of the time tested engineering principles of Janette power drives, an advanced line of Rotary Type Valve Drives is presented to meet the needs of oil, gas, water, sewage, and other types of installations.

Janette Rotary Type Drives are of the same general design and construction as those used extensively in Atomic Energy Plants, where performance and durability are vital. Built as a single unit, housings are sturdy, compact and weather-proof. Twelve assembly positions are available, with standard gear ratios of one and two R.P.M., and one thousand other options to meet special requirements.



Janette



A BRILLIANT ENGINEERING ACHIEVEMENT BY AMERICA'S BEST KNOWN MANUFACTURERS OF POWER DRIVES FOR INDUSTRY

Write for new illustrated brochure, with catalog pages giving complete specifications of eight available models. Of special interest to designers and engineers. Your letterhead is all that is required.

Electric Mfg. Co.

MORTON GROVE, ILLINOIS

To the man who's thinking about buying a new truck:

maybe you're missing something...

➢ And what you're missing is more than "maybe," it's for *sure*—if you haven't yet visited your Dodge truck dealer.

➢ Do you want to miss a *rock-bottom price?* Perhaps you haven't realized that Dodge trucks actually cost *less* than you'd pay for corresponding models of most other makes.

➢ Do you want to miss *power* so high it leads the field? Consider this: with engines of 169 to 175 horsepower, Dodge overpowers *every other leading make of truck* in the low- and medium-tonnage fields.

➢ Surely you don't want to miss the many advantages of "*Job-Rated.*" Because all units from engine to rear axle are engineered and matched for a specific job, the Dodge truck you buy is exactly *right* for your business.

➢ You don't want to miss Dodge safety—which includes the biggest wrap-around windshield of any truck on the road, the shortest turning radius. Or Dodge superior cab comfort . . . Forward Look Styling.

➢ In short, you get a whale of a lot more truck for a good deal less money than you think! Stop in and see your Dodge truck dealer right away—don't miss *anything!*

DODGE Job-Rated **TRUCKS**

WITH THE *FORWARD* LOOK ➢

are your possible savings on 73% caustic soda going down the drain?

Increases in freight rates over the past several years make it highly advantageous for you to re-examine the form of caustic you are buying.

A little figuring right now may save you thousands of dollars next year alone. Some of our customers who have converted from 50% to 73% have realized annual savings ranging from $2,650 to over $35,000.

Your location and the volume of caustic soda you use naturally influence the amount of your savings. But small and large users alike can frequently save substantial amounts now going down the drain.

Savings also are often possible with customers who buy solid and flake caustic.

The important thing is to do something about it now. It will cost you nothing to find out. Our Technical Service Department will be glad to assign one of its specialists to discuss your individual case, to make recommendations and to estimate your annual savings.

Write today to our Caustic Soda Department at the Pittsburgh Office.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati * Charlotte Chicago * Cleveland * Boston * New York St. Louis * Minneapolis * New Orleans Dallas * Houston * Pittsburgh * Philadelphia San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

there's

Clark HMA-10, 440 bhp "Midget Angle" equipped for a 3-stage gas lift application.

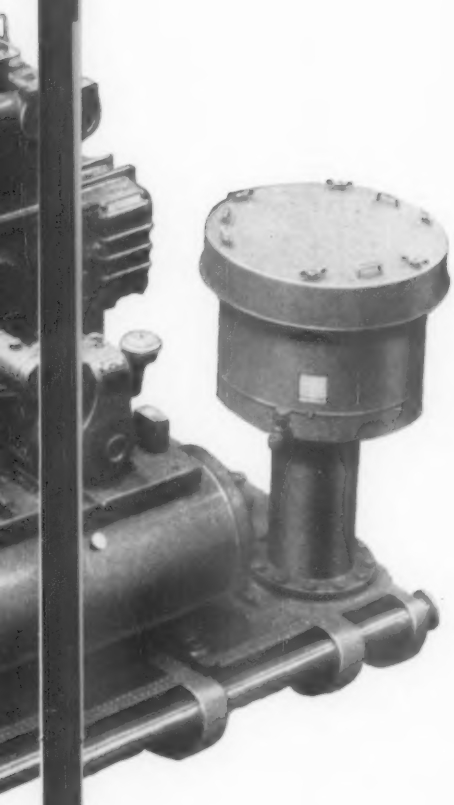
CLARK®

"Midget Angles"

Clark sets the pace in compressor progress

no basis for comparison

In selecting a packaged compressor for field use, *nothing* can be compared with Clark "Midget Angles." They stand alone on so many important points. There's just no *basis* for comparison.



DESIGNED SPECIFICALLY FOR FIELD SERVICE
Every operator knows how important this is in the tough kind of service a field compressor gets.

COMPLETELY FACTORY-PACKAGED
All units fully assembled and tested in the *Clark* plant.

HIGHWAY WIDTH
Most units can be transported, fully assembled, by truck trailer and railroad.

SINGLE RESPONSIBILITY
No buck passing! All major components are built and guaranteed by Clark.

PERFECT BALANCE
Clark Balanced/Opposed principle permits operation anywhere with little foundation.

TWO-CYCLE INLINE DESIGN
For maximum power, ruggedness, simplicity, accessibility and long oil life.

RESERVE OVERLOAD CAPACITY
Ample stamina to handle temporary overloads.

RUGGED, VERTICAL-AIR-FLOW RADIATOR
Clark-built. Unequaled in durability. A Perfect Match for these "Midget Angles." Prevailing wind direction can be disregarded.

MASSIVE, RIGID, ALL-STEEL SKID
Constructed entirely of I-Beams up to 18 inches in height. (Nearly 300 ft. of them in an HMA-10 skid.)

PRECISION CONSTRUCTION
Quality materials and precision workmanship assure continuous operation with minimum maintenance.

ECONOMICAL TO INSTALL
Only a simple slab of concrete, for leveling the unit, is needed to put the "Midget Angle" on stream.

HUNDREDS OF INSTALLATIONS
Used throughout the world in every conceivable type of service.

For field gas gathering, gas lifting, repressuring, recycling plant feeders, pipeline testing and many other field uses, Clark Midget Angles are the most economical answer in the 85-440 bhp range . . . *and Clark can deliver them in a hurry!* Your Clark representative will give you facts and figures. Write for Bulletin 126.

75 YEARS

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World

IT'S MORE THAN A SIGN OF QUALITY

it's a symbol of over 20 years' service to the gas-treating industry

MONOETHANOLAMINE
DIETHANOLAMINE 〉 **for H_2S and CO_2 removal**

DIETHYLENE GLYCOL
TRIETHYLENE GLYCOL 〉 **for H_2O removal**

Yes, you get more than the best gas-treating chemicals at CARBIDE. You also get these *extra* benefits.

- the services of CARBIDE technical representatives.
- laboratories that devote a great deal of time to advancing knowledge in this field.
- the "know-how" accumulated over more than twenty years by the first producer of these chemicals.
- a national distribution network of 49 warehouses and 14 bulk storage depots to assure you of continuous supply and rapid delivery. Shipments are made in tank cars, tank wagons, and drums in carload or truckload lots.

CARBIDE and CARBON CHEMICALS COMPANY

A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, New York
Offices in Principal Cities

INSTANT SHUT-OFF, FLUID TIGHT SEAL FOR RELIABLE CEMENTING

HALLIBURTON'S SUPER SEAL

Reliable cementing begins with a *super seal*– Halliburton's Super Seal. Its seal is tight to temperatures of 400°F. It can withstand pressures as great as contained by the heaviest casing yet tested. And it provides instant shut-off.

The Super Seal valve makes a conical band contact with its seat giving maximum available seal-off area. The seal-off ring is made of oil resistant rubber and is held securely in the valve groove for efficient sealing under the toughest conditions. The valve assembly has unusually high compressive strength which is combined with a float assembly of high shear and compressive strength. Yet, under normal conditions no "drilling out" difficulties are encountered.

Be sure of the best cementing conditions on your next well– use floating equipment with fluid tight seal and instant shut-off. Specify Halliburton's Super Seal. Call your local or district office of Halliburton Oil Well Cementing Company.

COMPLETE DATA SENT ON REQUEST

Get this valuable information for your Halliburton Service File.

HALLIBURTON CEMENTING SERVICES

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

ANY WAY YOU LOOK AT IT....

here's the BRAKE no rig should be without

PARKERSBURG HYDROMATIC

from the standpoint of PERFORMANCE

the Hydromatic is head-and-shoulders above any other brake since it goes into action automatically the second the load starts down. Braking power—provided by constant water supply—increases automatically with any tendency of load to increase speed. It does this without adjustment or manual operation.

from the standpoint of MAINTENANCE

it can't be beat since it requires no outside power or equipment. And since there is but one moving part to the amazing Hydromatic—maintenance is seldom ever required.

from the standpoint of ECONOMY

it's tops since it saves countless hours and dollars on round trips, prolongs the life of mechanical brakes by reducing wear and tear. Best of all, Hydromatic costs less to install—less to operate.

from the standpoint of SAFETY

it has no equal! If, under rare circumstances, the water supply to the brake should fail, you still have a reserve factor of safety. The water remaining in the brake will keep the load in check until mechanical brakes can be applied.

Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

5521

REDUCE YOUR "DOWN-TIME" WITH OPW valves

"Down-time" frequency for valve repair is appreciably lessened with OPW Valves specifically engineered for hazardous liquid service. They are ground tighter, engineered with larger stuffing boxes, machined to closer tolerances, and produced of the finest grades of bronze and aluminum. Highest possible quality is reflected in the dependability, ruggedness and precise flow control of all OPW Valves.

Recognizing the need and answering the demand for a valve which would reduce the tare weight of truck tanks without sacrificing peak efficiency, OPW has developed the lightweight 676. After exhaustive tests, it has been added to the complete family of OPW Valves.

CHARACTERISTICS OF THE 676 VALVE

Flanged or screw body and bolted bonnet of OPALUMIN, as strong as bronze, one third the weight. Interior parts of precision machined bronze. Ball and socket double discs, self aligning, tapered design seating against hand lapped renewable bronze seat rings for a sure, vapor-tight, no-leak closure. *Renewable seat rings are threaded and seated against shoulder,* so despite contraction and expansion of the body, the threaded ring remains seated. Compound double acting threads allow closer clearance when valve is opened, require fewer turns to open and close. Strong, large diameter stems do not bend.

Available in 3" size.

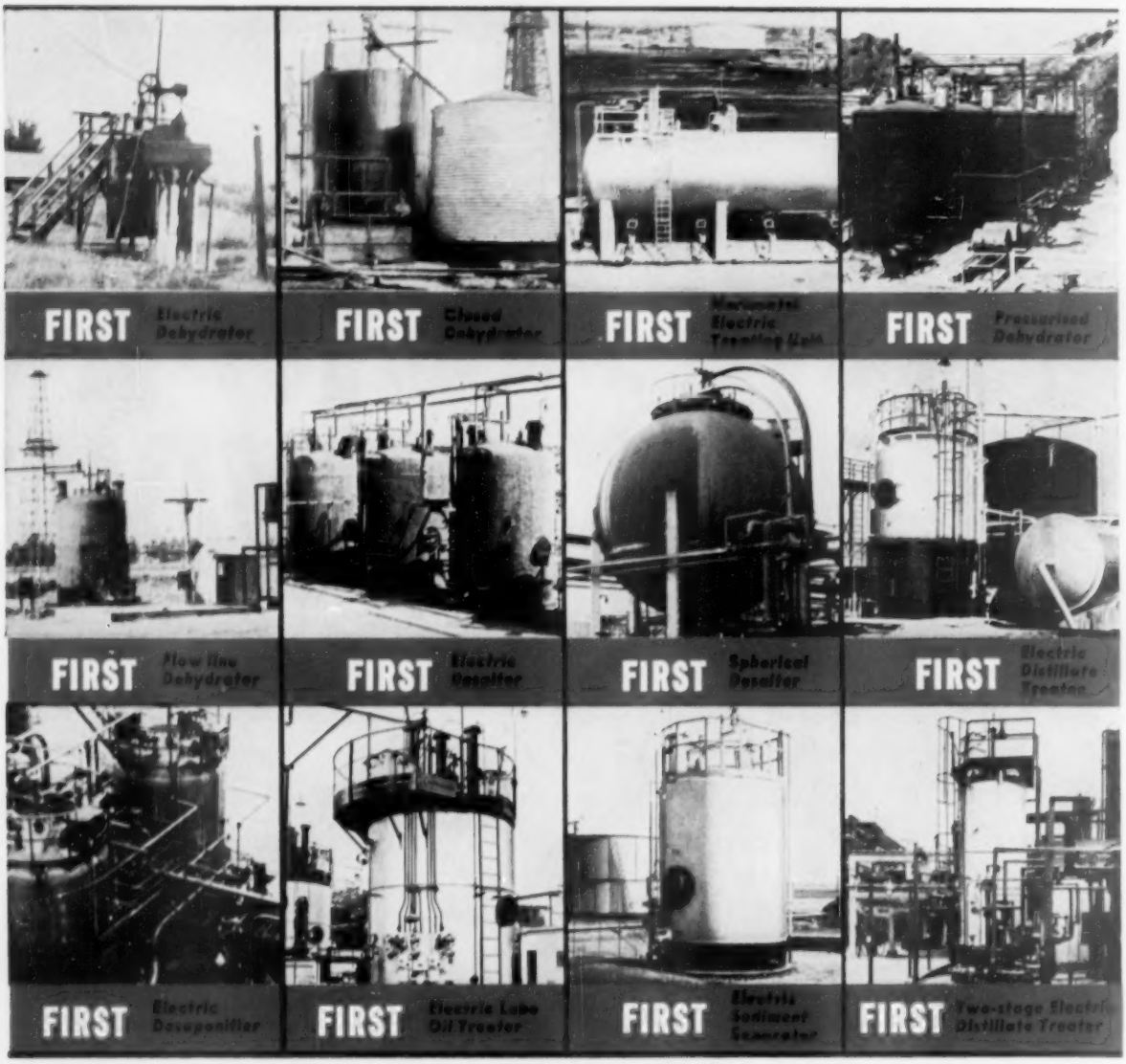
No. 676

GATE VALVES • EMERGENCY VALVES • CROSS CHECK VALVES • CROSS VALVES • CHECK VALVES • GLOBE VALVES • PRESSURE RELIEF VALVES • COMPRESSION CHECK VALVES • LOADING VALVES

OPW CORPORATION
2731 COLERAIN AVE. • CINCINNATI 25, OHIO

LEADERSHIP

Petreco leadership in electric processing is based on a long series of "firsts"



This foundation of progressive pioneering has enabled Petreco to help various branches of the industry increase both efficiency and profits. When emulsification threatened to cause the waste of millions of barrels of "cut" oil, Petreco brought out the first electric dehydrator. When salt was first recognized as an enemy in refining, Petreco developed the first electric desalter. When sediment in certain crude oils shortened the life of sub-surface pumping equipment, Petreco developed the electric sediment separator. As refinery processing became more precise, Petreco provided electric distillate treating to insure precision-controlled contacting, scrubbing and washing.

There is one basic and important reason why Petreco has been able to carry on this continuing program of pioneering development — the users of Petreco processing have profited substantially from this use.

For complete information on any of the Petreco electric processes, write or call

PETRECO

A DIVISION OF
PETROLITE CORPORATION
3202 South Wayside Drive, Houston 1, Texas
1390 East Burnett Street, Long Beach 6, California

PETRECO®

AP-8

NATIONAL STORES
get a new look to serve you better!

Have you recently noticed any "face-lift" jobs on older National Supply Stores in your area? If you haven't, you may see some soon. Each will be part of a long-range store modernization program we've put into effect to serve you better.

The old wooden, space-wasting porches, remnants of another era, are going. Instead you'll find new concrete-based loading docks, with high and wide openings for easier, faster stock handling. Heavy equipment yards are losing that "stockpile" look as machinery is evenly spaced and arranged for your close inspection. There are bright new National signs, too—just so our newer friends won't miss our locations. Over-all, store exteriors are looking very modern and efficient. But that's only half of the new look story.

National Supply Store *interiors* are getting the treatment, too. In glare-proof lighting, you'll see long, modern counters—some with "picture window" fronts. There are new shelves and bins. Colorful displays. Handy product literature racks, loaded with helpful information. In a modernized or new National Supply Store, you can quickly see and personally select the quality equipment, parts and accessories you need.

This "operation face-lift" means more convenient and time-saving shopping for you. In effect, it means we can serve you better and faster. Why not try this service soon?

THE
NATIONAL SUPPLY
COMPANY

You don't have to pamper these

Pumping units, especially, have to be "pamper-proof." They have to be simple, compact and strong—you want them to operate constantly for long periods with very little attention. Check these features of National "Type E" Pumpers, and you'll see why they easily meet these requirements:

Easy-to-install, extra strong main base. Box and sub-base design of the "E" units provides maximum strength, rigidity and counterweight clearance for quick and simple floor level installation.

Rugged gear reducer for extra stamina and longer life. National "Type E" Pumping Units have exceptionally hard alloy steel gears and pinions designed for long wearing life. Gear train mounting and main bearings offer lower shaft loading and deflection . . . easily handles shock loads from load reversals.

Exceptionally stable, well balanced samson post. Legs are rigidly cross-braced, designed to distribute beam load over entire foundation area, and to give better balance for transporting.

Pitman assembly features easy maintenance, fast assembly. The simple, clean design of Pitman assembly components insures positive alignment and proper fitting. Over-all construction of the assembly makes field servicing simple and easy.

Rugged walking beam and beam hanger for extra years of service. Heavy-duty walking beam is designed for minimum critical stress in National's "Type E" Pumping Units. The beam hanger design insures correct alignment to the polished rod throughout the stroke range, and is built for easy field servicing of its component parts.

Get the complete facts on National "Type E" Pumpers today. For the full story on the high performance and low operating costs they offer, see the National Supply Store men or representatives in your area soon. New bulletins describing these quality pumping units are available.

NATIONAL "TYPE E" PUMPERS!

It pays to get
the pumper that's <u>just right</u>
for the job from

**NATIONAL'S
COMPLETE LINE
OF TYPES AND SIZES**

Beam Counterbalanced Types	API Walking Beam Rating, Lb.
D-3	3,200
D-4	4,100
D-5	4,790
D-7	6,500
E-9	8,900
E-11	11,000

Crank Counterbalanced Types	API Walking Beam Rating, Lb.
E-9	8,900
E-11	11,000
E-13	12,750
E-15	15,000
E-21	21,000
E-24	24,000
D-29	29,900
D-32	32,400

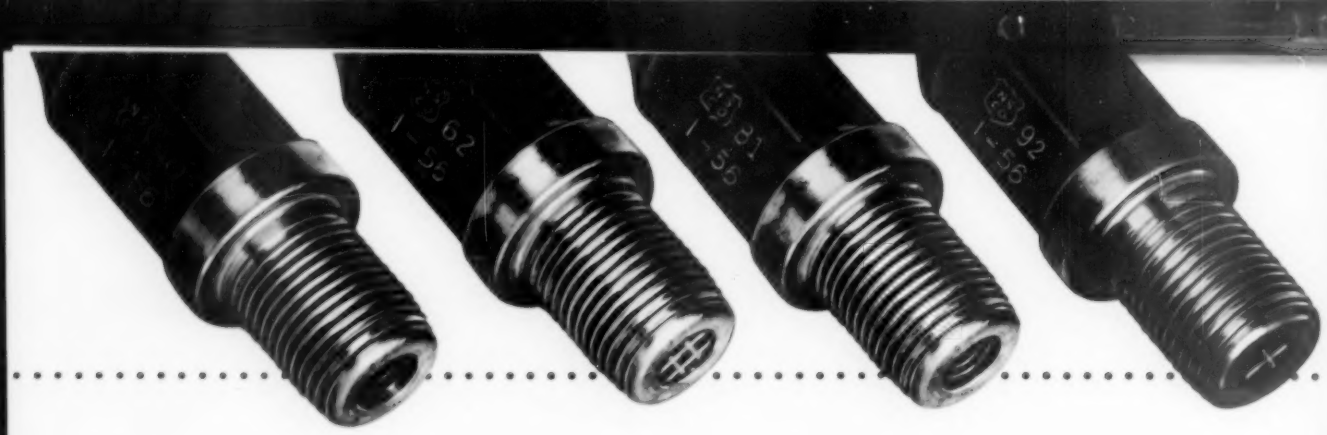
The complete line of National Pumping Units offers a model to economically suit every pumping job. In the range of API rated beam loads from 3,200 to 32,400 lbs., there are 22 standard combinations to meet your requirements. Get complete details at the National Supply Store in your area.

THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N. Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE • SPANG ELECTRICAL CONDUIT

More National equipment for profitable production . . . on the next page



Grade 40 — for little or no corrosion

Grade 62 — for medium corrosion-medium sulphide

Grade 81 — for bad corrosion but little sulphide

Grade 92 — for severe sulphide corrosion

You get trouble-free service at any depth WITH NATIONAL SUCKER RODS!

Whatever the pumping conditions, you get low-cost sucker rod service when you select the National string that's right for the job. National Sucker Rods are:

Quality-controlled to give you the ultimate in uniformity, dependability and economy

Engineered for maximum resistance to shock, corrosion, fatigue and impulse loads

Precision-manufactured of top-grade steel on specially-developed machines

They reach you in factory condition, too, whether you order from stock at a National Supply Store or directly from the mill. National's careful methods for stacking, handling, shipping and field storage have been proved by hundreds of shipments to all parts of the world.

In a new bulletin covering National Sucker Rods, you can get complete information on the grades shown here. Ask the National representative in your area for a copy soon.

THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N. Y., U.S.A.; City Wall House, Chiswell Street, London E.C.1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE • SPANG ELECTRICAL CONDUIT

You get sound performance, too, from . . .

NATIONAL Wellhead Equipment

Interchangeable units provide many combinations to meet your specific needs in size, capacity and type. Ease of assembly and pre-tested safety are two major features of this equipment.

NATIONAL Ideal Plunger Lift®

This unit uses formation pressure for economically producing wells where reservoir conditions are suitable. For these certain types of wells, it can be the best production method.

NATIONAL Triplex Pumps

These pumps provide maximum volume and injection pressures for today's waterflood projects. Available in several hp ratings for both corrosive and non-corrosive service, they are especially suited as power-oil sources for subsurface hydraulic pumping, oil gathering and salt water disposal services.

It's a long time between parts

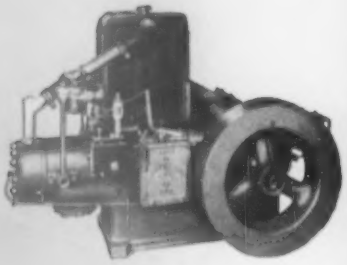
with *Ajax*

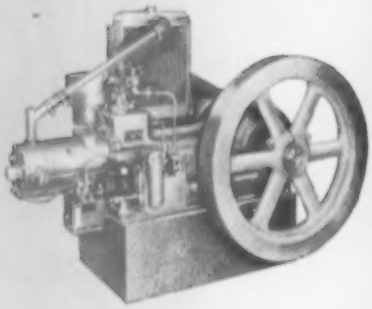
BUT WHEN YOU NEED 'EM
THEY'RE RIGHT NEAR BY!

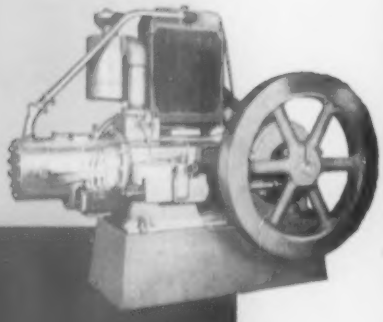
NATIONAL Supply Co.

BETHLEHEM Supply Co.

R. B. MOORE Supply Co.

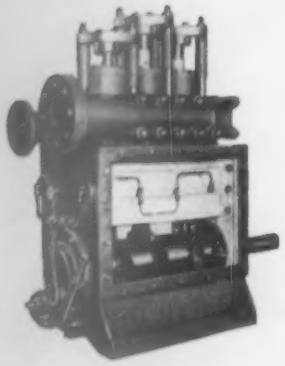






AJAX

GAS ENGINES
PRESSURE PUMPS



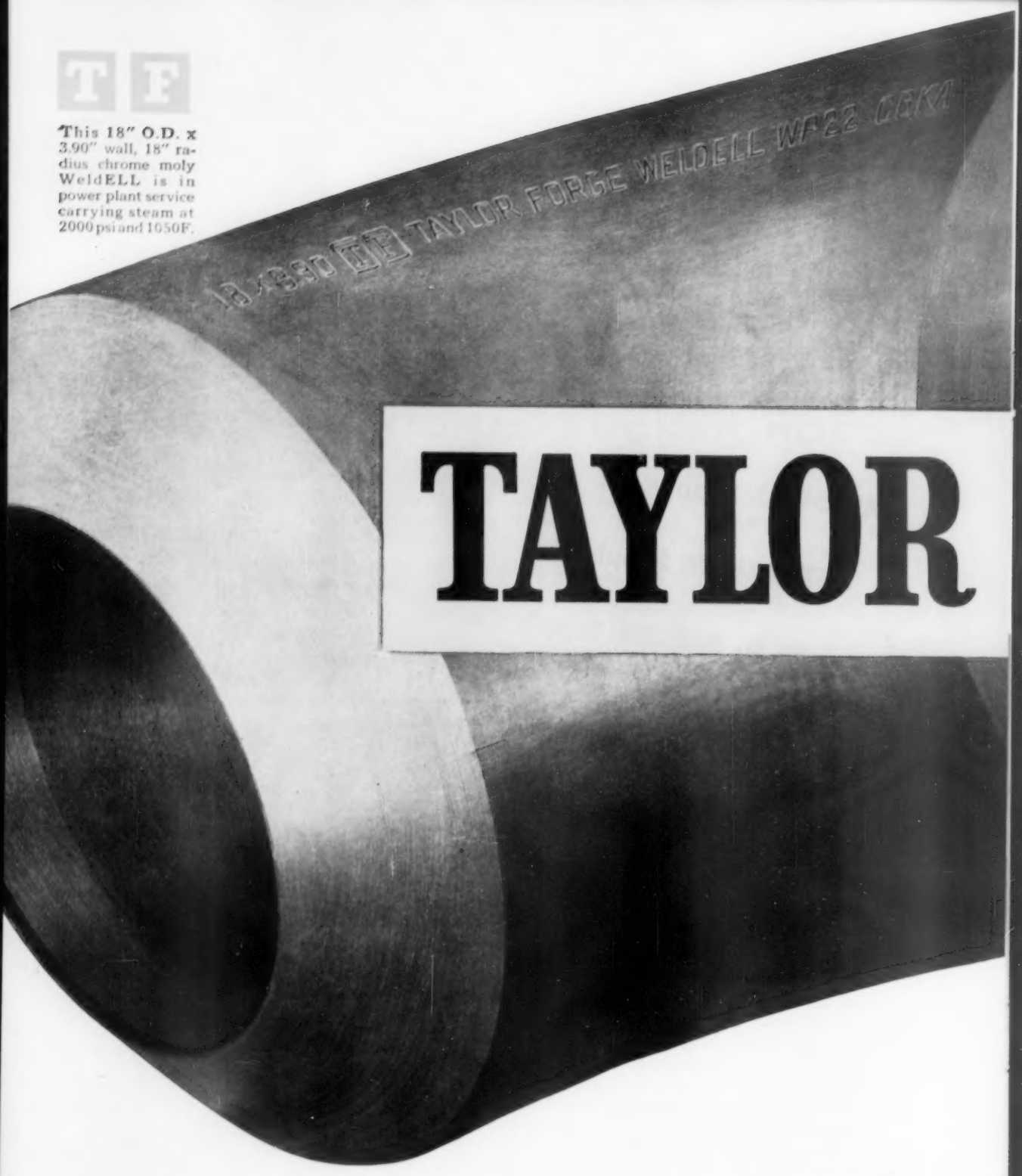
You get years of service without incident from AJAX Engines and Pumps. Every Ajax part is built for long life in the field under continuous operating conditions. But when you *do* need a replacement item, it's mighty easy to pick up. Just stop at your nearest National, Bethlehem, or R. B. Moore supply store, and you'll find it waiting. ● AJAX units are easy to service, too—almost 80 years of experience in building oil country engines makes sure of that. ● Make sure *your* next pump or engine is an Ajax: see your Supply Man for the detailed facts!

AJAX IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS,
STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N. Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA



This 18" O.D. x 3.90" wall, 18" radius chrome moly WeldELL is in power plant service carrying steam at 2000 psi and 1050F.

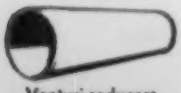
TAYLOR

Welding nozzles

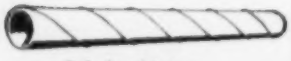
T.E.M.A. flanges and channels

Multiple outlet headers

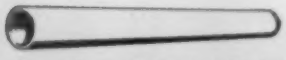
Production forgings



Venturi reducers



Spiral weld pipe

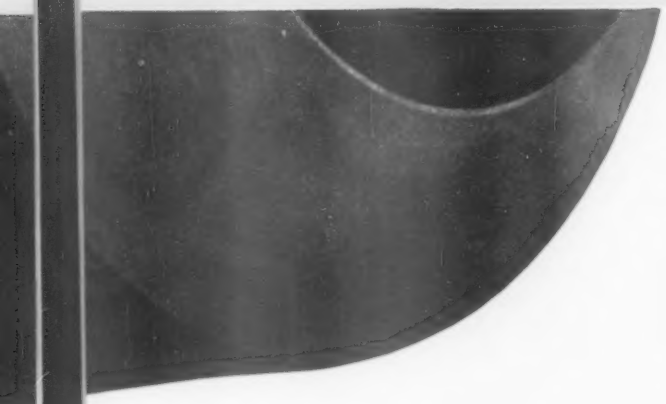


Large diameter electric weld pipe

Welding necks

Traditionally Dependable

FORGE Welding Fittings and Forged Flanges



Engineered for accuracy . . . forged for greatest strength and longest life . . . backed by the know-how that has come with 55 years of experience in the forming of metal products by hammering, rolling, extruding, drawing, pressing, welding—in fact, by every known basic metal working process.

That's why . . . by any standard of comparison . . . by any method of value analysis . . . you can't buy better products than those of TAYLOR FORGE.

For EVERYTHING in Welding Fittings and Forged Flanges . . . every type, size, thickness, pressure rating, material . . . turn to TAYLOR FORGE.

Taylor Forge & Pipe Works

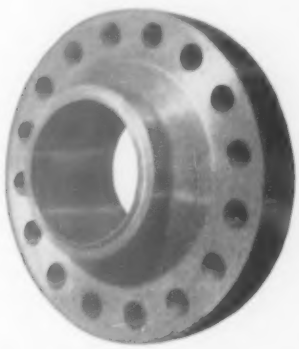
General Offices and Works: P. O. Box 485, Chicago 90, Illinois

Plants at: Carnegie, Pa.; Gary, Ind.; Houston, Texas; Fontana, Calif.; Hamilton, Ont., Canada

District Sales Offices: New York, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Toronto, Calgary.

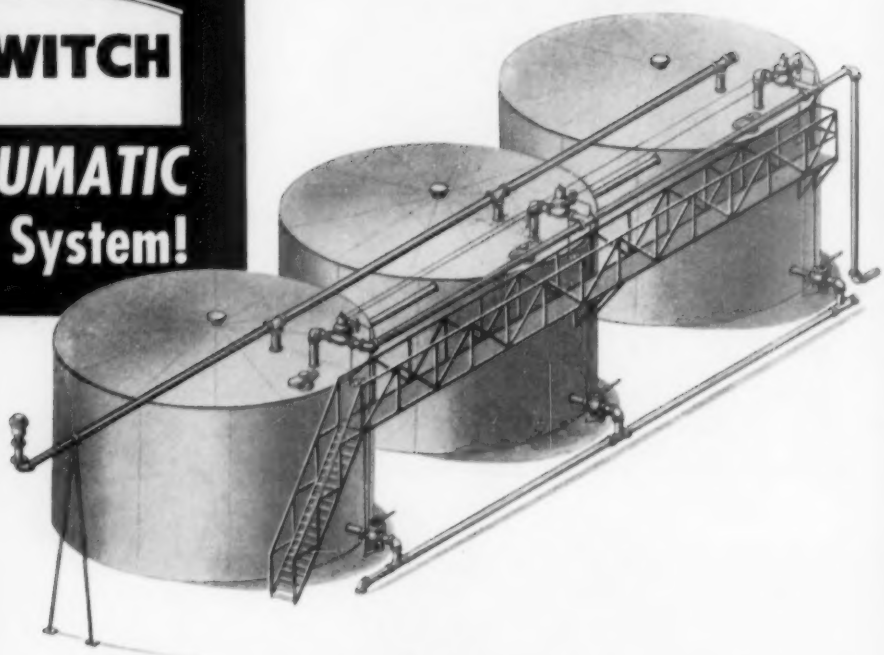
There's a Taylor Forge Distributor near you

He carries a full stock of Taylor Forge Welding Fittings and Forged Steel Flanges and can supply your needs promptly. He's a good man to know for he's exceptionally well informed on the subject of piping and through him you have available the services of Taylor Forge engineers for help and advice on any piping problems.



You DEMANDED It...BS&B Has *Produced* It...

Here's The New BS&B AUTO-SWITCH ...An *ALL-PNEUMATIC* Tank Switching System!



Advantages of BS&B AUTO-SWITCH

- Use of separator gas for the power medium eliminates need for outside power source.
- Most components of the system are standard pieces of control equipment already familiar to the man in the field.
- Automatic controls eliminate the possibility of overflowing the storage tanks.
- Tank batteries in remote locations can operate unattended for long periods of time.
- Direct savings in labor cost and indirect savings in improved production control can easily justify the cost of the equipment.
- Indirect savings also result from the use of safety controls to protect against loss of equipment and oil.
- Normal duties of gauging, "thief-ing" or tank maintenance may be carried on without interrupting the functioning of AUTO-SWITCH.
- AUTO-SWITCH is readily adaptable to "customized" installations designed to fit the needs of the individual lease.

* Also available from BS&B are automatic safety shut-down controls for treater, separator and wellhead to protect lease equipment and prevent loss of oil in cases of emergency.

In keeping with the Oil Industry's demand for more and more fully automatic production equipment, we are pleased to announce the new BS&B AUTO-SWITCH ... an all-pneumatic tank switching system.*

This system is designed to switch the flow of oil from tank to tank as each becomes full. When all tanks are full, the system shuts itself in. Automatic reset is provided to repeat the cycle if upstream tanks have been drained.

Interlocks are provided to prevent the fill valve from opening as long as the manual pipeline valve is open. Full tanks are automatically by-passed. Tanks may be taken out of service for cleaning or repair without interrupting the operation of the battery.

The installation of BS&B AUTO-SWITCH Systems on your tank batteries will result in direct savings in labor cost, and indirect savings in improved production control for higher ultimate recoveries. For complete information, contact your BS&B Representative or write to ...

EFFICIENCY BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.
Oil & Gas Equipment Division, Dept. 1-A1A
1708 West Main Street Oklahoma City, Oklahoma

COST REDUCERS DO BIG JOB

on Transcontinental line

TUBE-TURN* Venturi Reducers minimize cost of valves and scraper traps on 36" line of Transcontinental Gas Pipe Line Corporation. Here's action at Station 15 near Mooresville, North Carolina. Contractor on this section: Panama Williams Corporation.

Two 30" x 24" TUBE-TURN Venturi Reducers welded to 24" valve.

Two TUBE-TURN Venturi Reducers, 36" x 30", welded to 30" valve.

Welding 32" x 30" TUBE-TURN Venturi Reducer to scraper trap for pipe line cleaner.

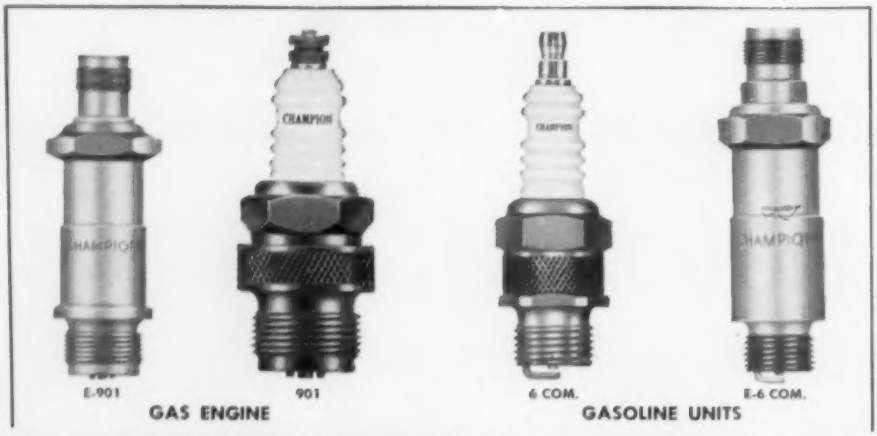
*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

tt TUBE-TURN

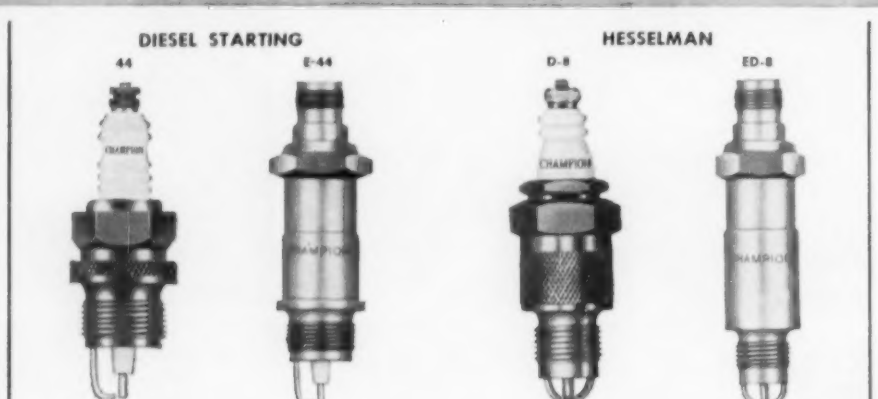
TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas



For better performance in every industrial and oil field engine specify dependable CHAMPION SPARK PLUGS!

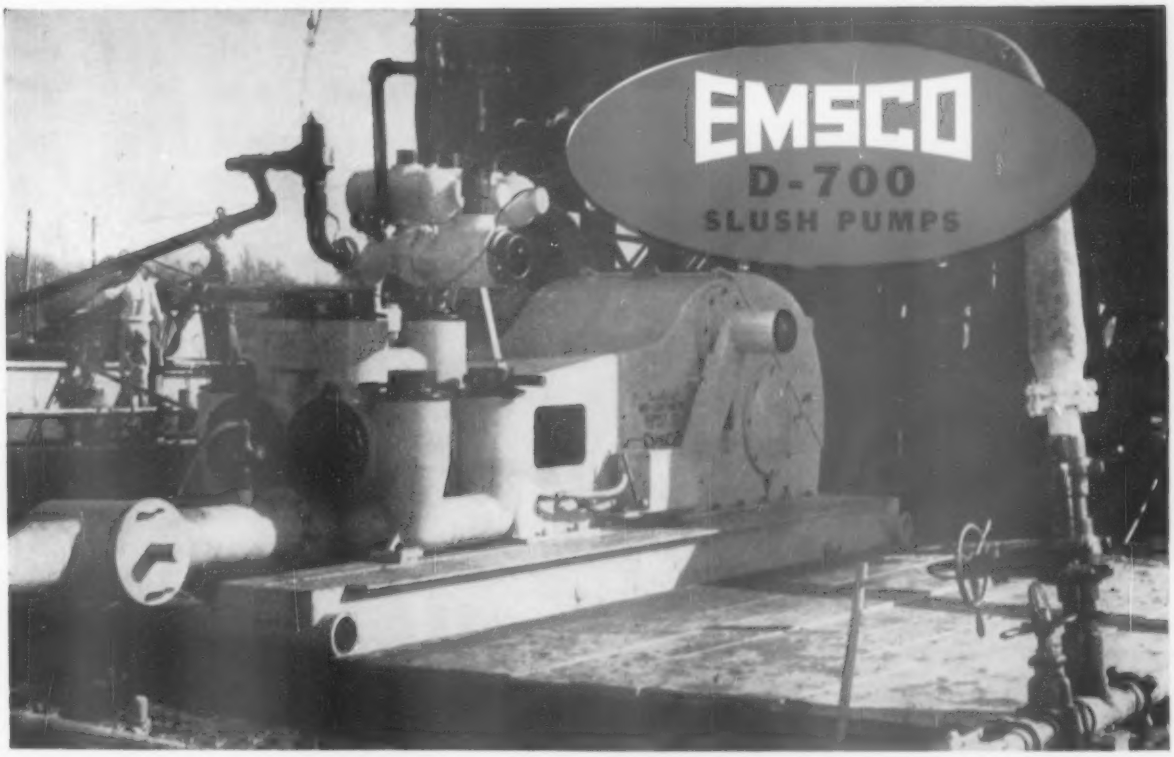


BEST FOR ANY ENGINE

CHAMPION

SPARK PLUGS

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO



Pace-setting Performance...for Jet Bit, Big Hole and Deep Drilling

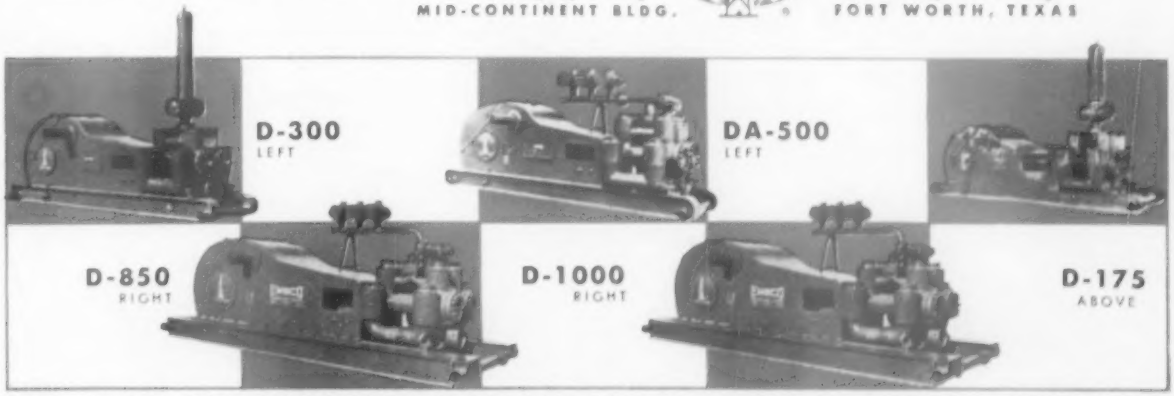
PESA

For complete information on Emsco Pumps for every drilling requirement, contact your nearest Mid-Continent store or representative.

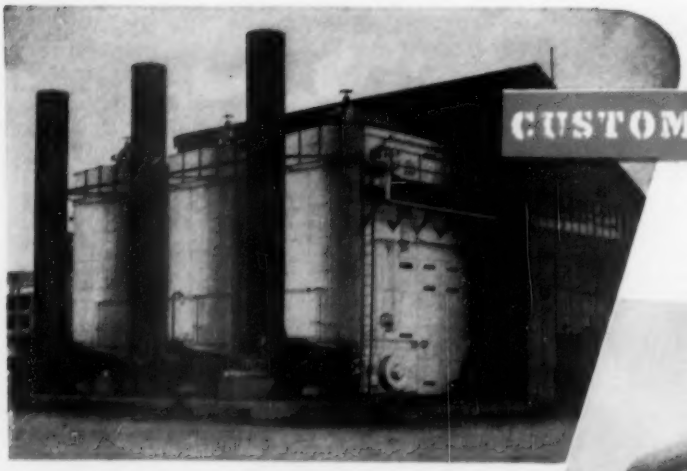
With the Emsco D-700, it is usually unnecessary to parallel (or compound) pumps to get mud volumes and pressures needed for jet bit, big hole and deep drilling. This pump is designed to meet specialized mud circulating requirements and incorporates all the features which have made Emsco pumps famous for dependable performance and low-cost operation.

EXCLUSIVE EXPORT DISTRIBUTORS
EXPORT DIVISION
45 ROCKEFELLER PLAZA • NEW YORK, N. Y.

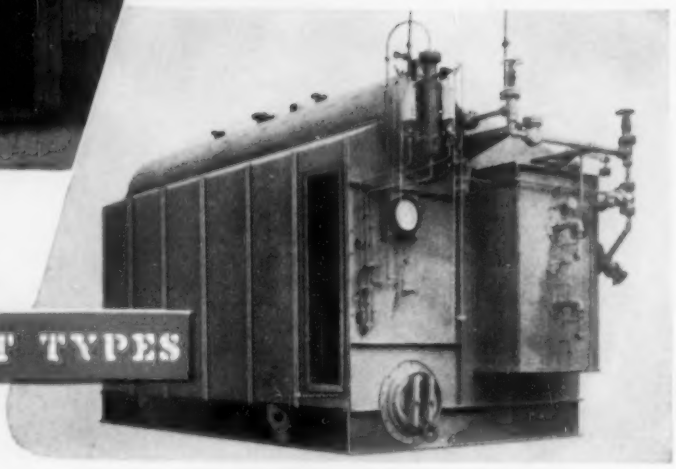
MID-CONTINENT
Supply Company
MID-CONTINENT BLDG. FORT WORTH, TEXAS



THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



CUSTOM BUILT TYPES



PACKAGE UNIT TYPES

Stop 'n Shop at Vogt

for modern Steam Generators

Types and Sizes for Every Power, Processing and Heating Requirement

Steam costs too high? Then it's high time to replace outmoded boilers with modern Vogt steam generators of the type and size to exactly fit in with specific operating conditions.

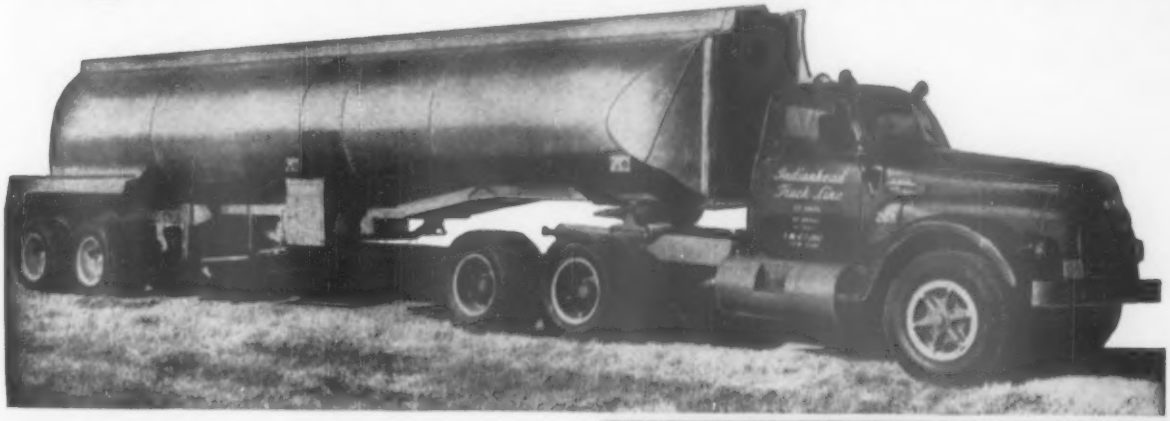
Vogt steam generators are designed to give maximum rating in minimum space, with high efficiency and low maintenance expense. They are available in bent tube types and straight tube, forged steel sectional header types for solid, liquid or gaseous fuels burned singly or in combination.

Package units range from 10,000 to 30,000 pounds capacity and custom built units are obtainable in the larger capacities. Many installations in successful operation are proof of Vogt's ability to give effective help in the solution of steam generating problems. *Bulletins may be had upon request. Address Dept. 24-BO.*

HENRY VOGT MACHINE CO.
LOUISVILLE, KENTUCKY

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

Sigma Welded Aluminum Tanks



—WEIGH LESS
—CARRY MORE
—LAST LONGER

The problem of how to get bigger pay-loads in truck trailers and semi-trailers was solved by one manufacturer who converted to weight-saving aluminum and sigma welding . . . These giant semi-trailer tanks hold 7,950 gal.—700 gal. more than similar tanks made of steel.

The high quality of sigma welded aluminum has increased tank resistance to corrosion. Sigma welding has also eliminated expensive weld cleaning—welds need only a light grinding and they are finished. Each semi-trailer requires about 1,100 linear ft. of sound sigma welding. The new high-strength, ductile alloys used range in thickness from 3/32 to ½ inch.

Like many other products throughout industry, these trailers are being fabricated with new quality and efficiency using sigma welding.

Here are some features of sigma welding—

- Uses any d.c. or constant potential power supply. With c.p. voltage is held constant—welding operations are fast and more efficient.
- Makes smooth welds in joints of all types—on all commercially welded metals . . . joins metals up to ¼ in. thick in one pass.
- Sigma welding speeds exceed 100 in. per min. in many operations. Start saving now, call your local LINDE representative for more information—and ask for Form 7942 "Modern Methods of Joining Metals."

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation

Linde
Trade-Mark

AVAILABLE JOHNSTON by AL CAPP

HALP!!
-I HEARD YO' JOHNSTONS GOT A BOB-TAIL PANTHER!!
HEVVINS, NO!! — IT'S MERELY A BOB-TAIL PACKER!! — A TESTIN' TOOL THAT PREVENTS EX-TROOSION!!-
IT'S A PIECE OF E-KWIP-MUNT, THAT MAKES TH' PACK-OFF UP TO 30% MORE EFFECTIVE!!
OH!!
DON'T GO!! SET A SPELL, AN' TELL ME ALL 'BOUT IT!!
SORRY!! US JOHNSTONS GOTTA GET T' TESTIN'!!
-AN' WITH TH' BOB-TAIL PACKER, WE CAN DO A BETTER JOB THAN EVER BEFORE!!
Al Capp

C-5410

Copr. Capp Enterprises 1954

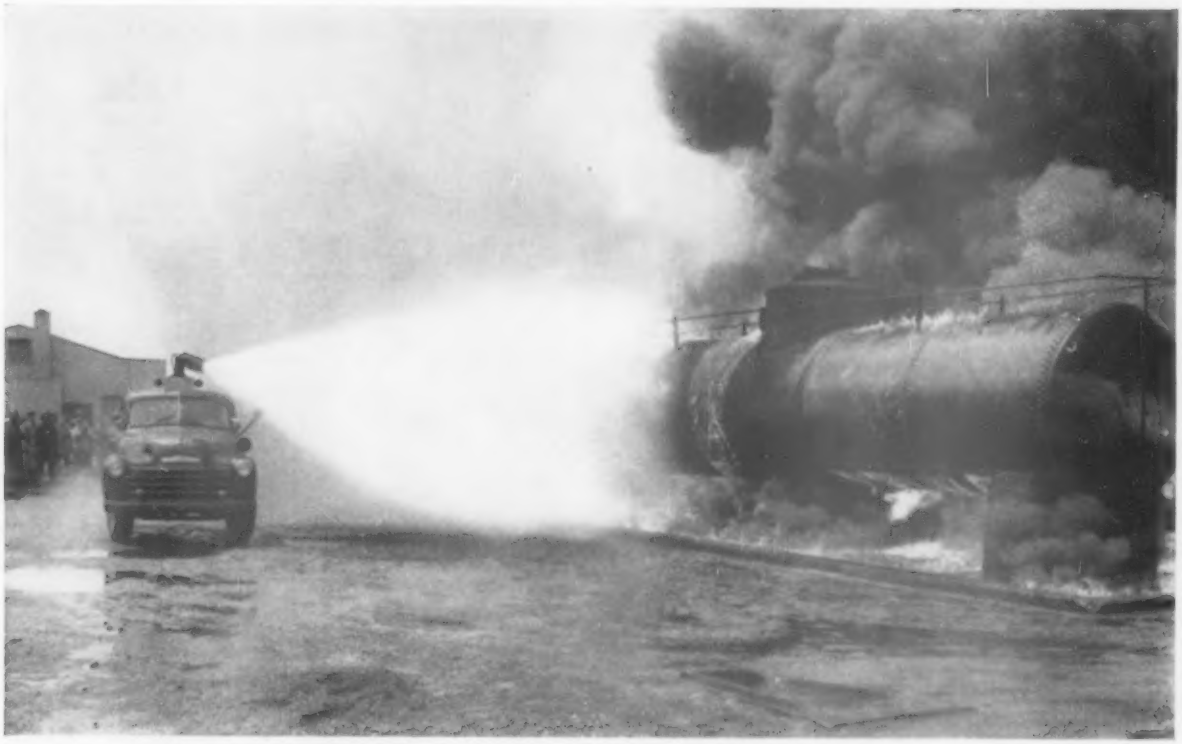
JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES, CALIF • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON



One man in this midget fire truck puts out the fire. Rockwood equipment makes it possible!

"Mighty Mite" puts out fire in 45 seconds

"Mighty Mite" is a swift fire fighter!

It was just a test, but the fire was real. Fuel in a pit under the tank car was set on fire. Fuel poured on top of the car from pipes was also ignited. The blaze was given a minute's start.

"Mighty Mite", loaded with Rockwood fire fighting equipment, went into action. The blaze was choked off in 45 seconds by Rockwood WaterFOG from Rockwood's Remote Manual Control Turret!

Rockwood equipment makes the small truck a big fire fighter. The Turret Nozzle does many jobs—discharges solid water stream, WaterFOG, FogFOAM, solid FOAM stream, "Wet" solid water stream, and "Wet" WaterFOG!

For complete details on this powerful Rockwood equipment send coupon below.

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

Distributors in all principal cities

"Mighty Mite's" equipment includes: 4 stage centrifugal pump, 200-gallon booster tank, Rockwood Dual Suction Proportioning System for FOAM and "Wet", Rockwood Remote Manual Control Turret controlled from within the cab, Rockwood Ground Sweep Nozzles, Rockwood Remote Control Ball Valves, 2 hose reels with 200 feet of high pressure hose with new Rockwood High Pressure Handline Nozzle on each reel.

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1068 Harlow Street
Worcester 5, Mass.

Please send me your illustrated booklet on Rockwood fire fighting products.

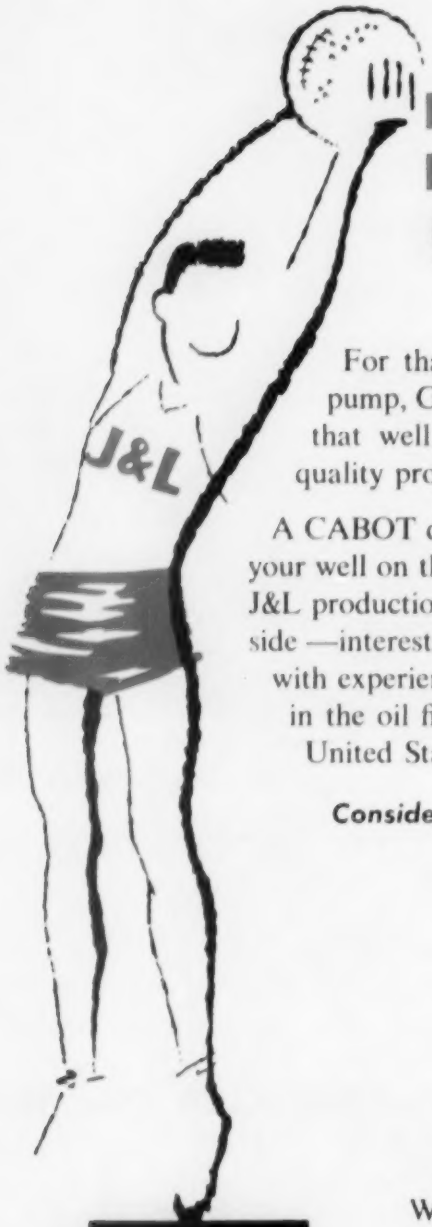
Name .....

Title .....

Company .....

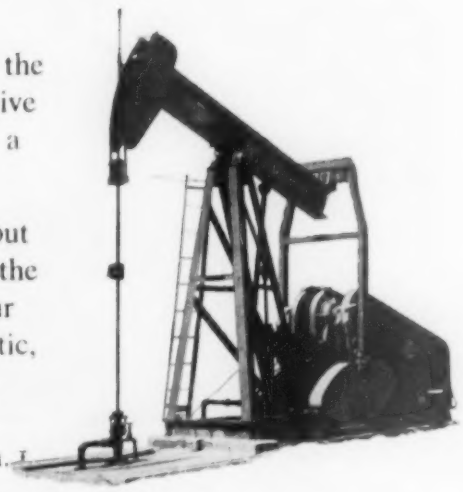
Street ..... *City* .....

Zone ..... *State* .....



PUT J&L ON YOUR PRODUCTION TEAM!

Get a CABOT!



For that next well on the pump, Get a CABOT. Give that well a break using a quality product.

A CABOT does more than put your well on the beam. It gets the J&L production experts on your side —interested and enthusiastic, with experience rooted deep in the oil fields of the United States and Canada.

Consider only a few important FACTS:

1. Unsurpassed quality of material and workmanship.
2. Unexcelled field service.
3. Equalastic (patented) rubber tail bearing.
4. Simple, effective adjustable crank counter balances.
5. Integral low-shaft-center reducers (no oil seals).

We want to be there with a CABOT when your next well goes on the pump — get your J&L store on the telephone now.

J&L STEEL

Jones & Laughlin

SUPPLY DIVISION - Tulsa

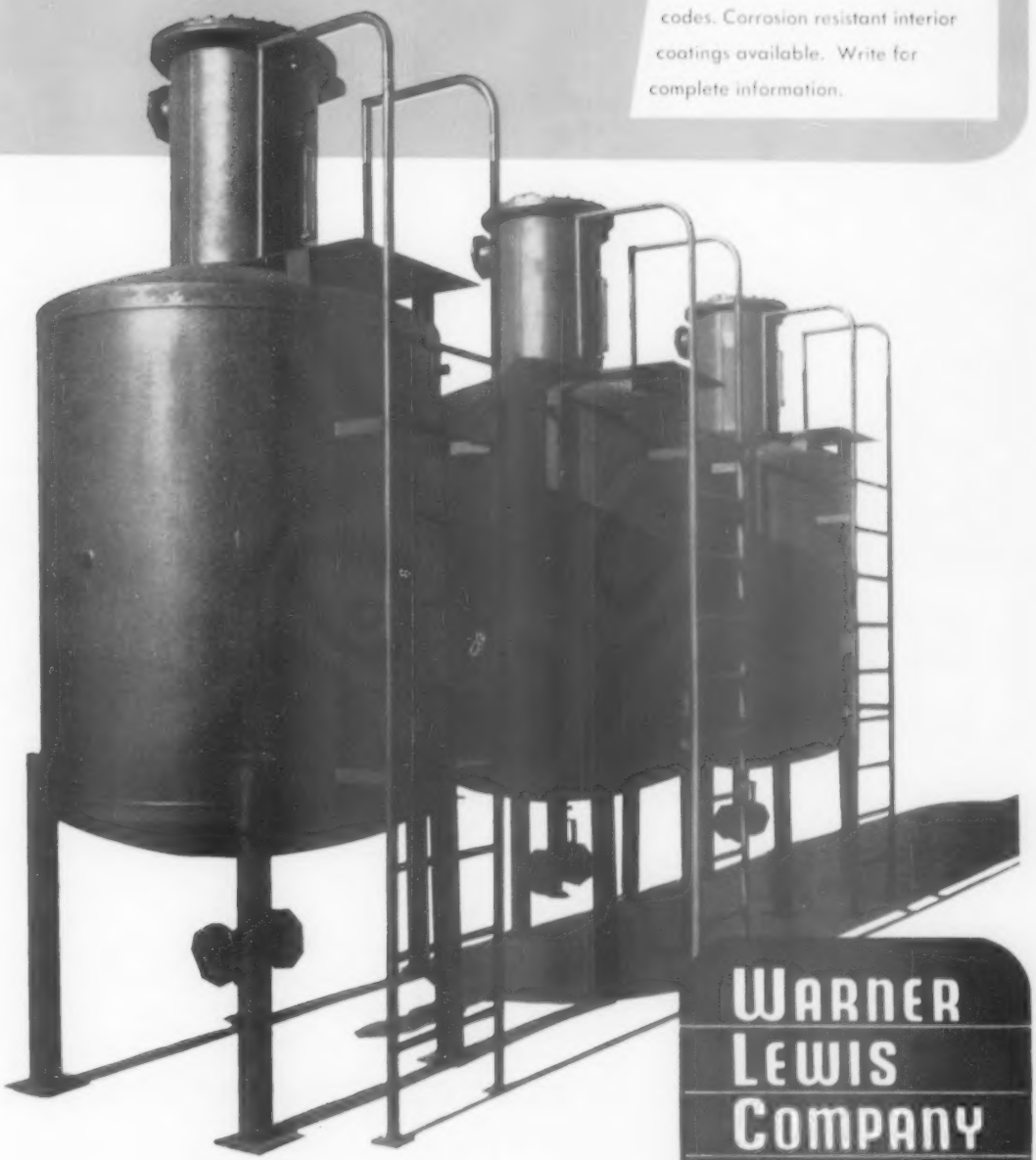
SERVING THE UNITED STATES AND CANADA

4 M

large capacity pipeline meter calibrating tanks

Let our years of experience in the design and fabrication of these tanks help in your planning of meter calibrating tank installations.

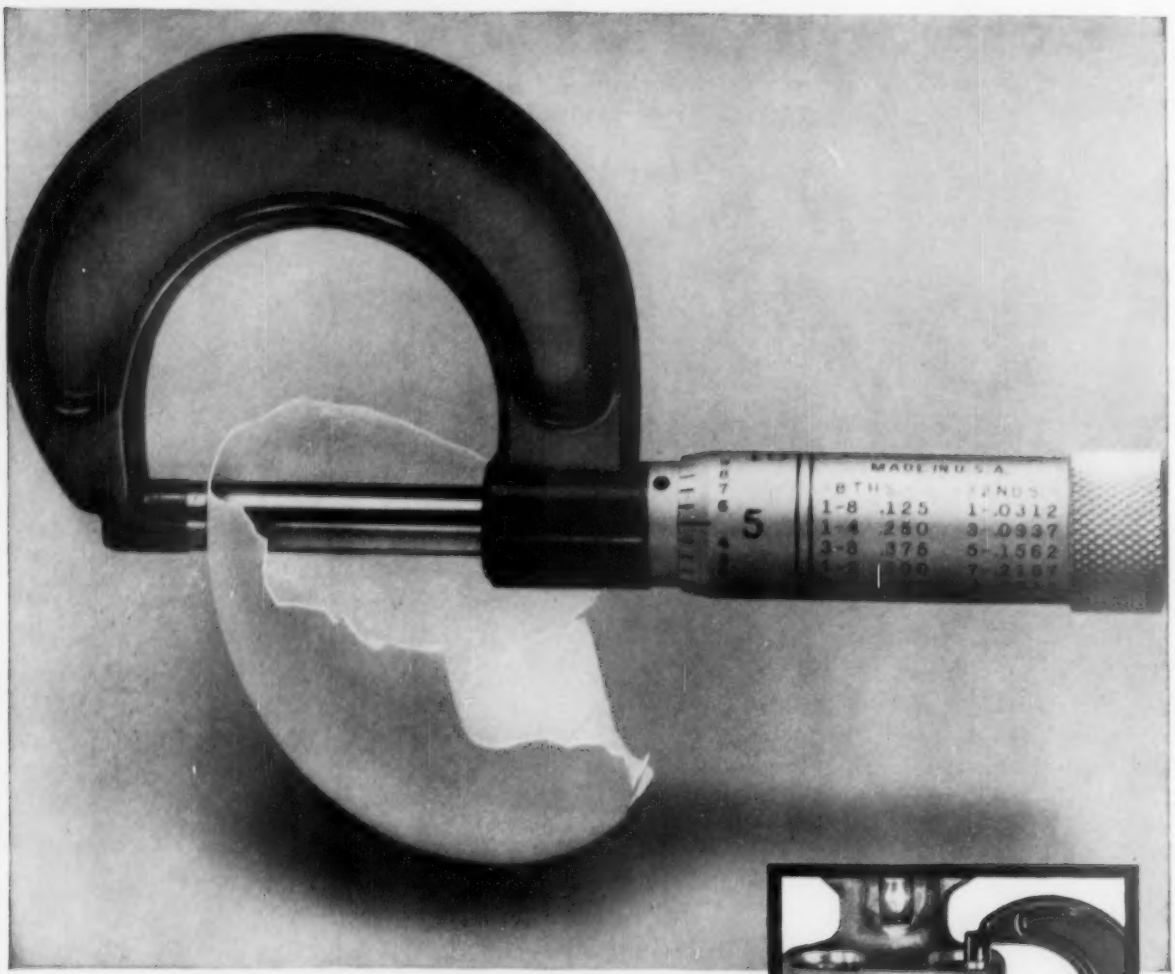
Built to API code 1101 (tentative) and API-ASME codes. Corrosion resistant interior coatings available. Write for complete information.



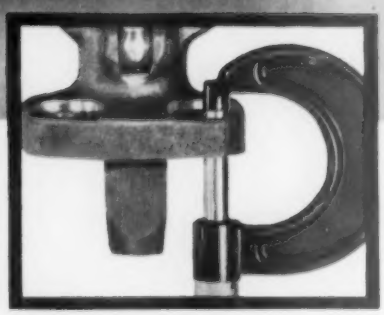
WARNER LEWIS COMPANY

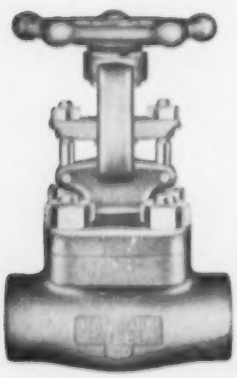
BOX 3096 • TULSA, OKLAHOMA

DIVISION OF FRAM CORPORATION



STRENGTH
that matches the purpose





THE BONNET FLANGES on the Type 950 Hancock Steel Gate Valve combine compactness with rugged strength *where strength is needed most*. Flange thickness and bolting provide sturdiness that can withstand more than ten times the rated pressure of the valve. Butting of the flange faces eliminates every possibility of bending and distortion.

In revalving old, or installing new process and power piping systems, the enduring strength of Type 950 Hancock Steel Gate Valves always proves there is no substitute for the economy of quality. Get complete facts. Phone your Industrial Supply Distributor today.

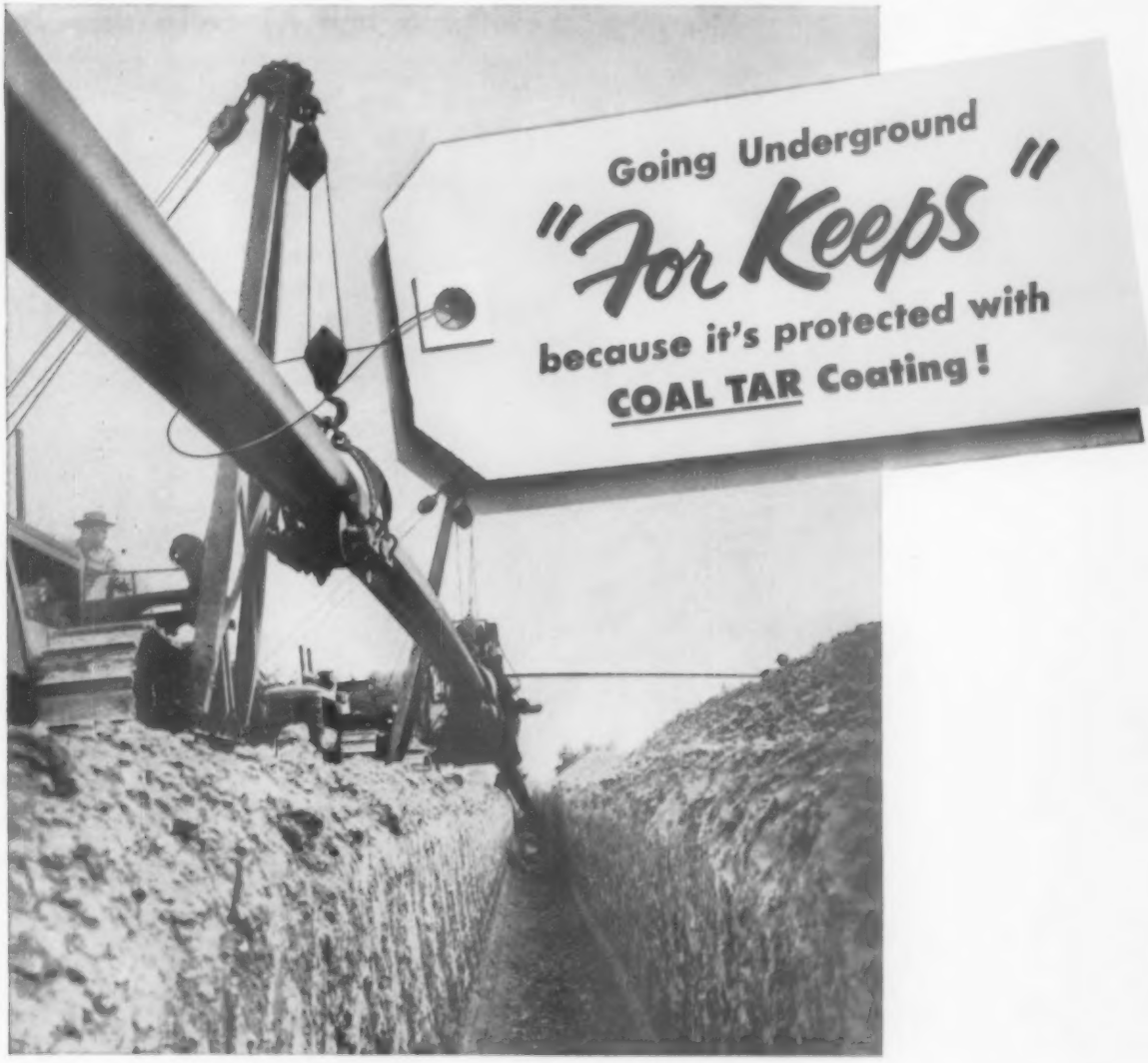
HANCOCK VALVES

A product of

MANNING, MAXWELL & MOORE, INC.

Watertown 72, Massachusetts

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*



EACH year an overwhelming majority of pipeline owners and operators select *coal tar* coatings to protect their long-term investment. And with good reason: No other material can match coal tar coating's *proven* record of economical, long-lasting protection.

Coal tar coatings are amazingly durable. And their life is measured in decades—thanks to their inherent ability to resist soil stress and water absorption, the two big reasons why other materials fail.

If you'd like to be sure of the *best* pipeline protection that money can buy, specify *Pitt Chem* Coal Tar Coatings, just as scores of leading pipeline companies do. When you buy *Pitt Chem*, you buy *assured* pipeline protection with every drum, because *Pitt Chem* Coal Tar Coatings are manufactured to rigid, *published* specifications by a basic producer. If *you* have a pipeline protection problem, chances are we have the answer. *A phone call will place an experienced Pitt Chem man at your service.*

PITT CHEM® TAR BASE COATINGS

Standard Grade Modified Grade
Plasticized Grade Hotline
Cold Applied Tar Base Coatings

PROTECTIVE COATINGS DIVISION
PITTSBURGH COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

W&D 5885

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

NEW BRISTOL 500EW Air-Operated Controller offers proportional band to 400% and reset-plus-derivative control.

New Bristol 500W Air-Operated Controller offers proportional band-width up to 400%

The new 500W Controller, latest addition to Bristol's 500 Series of Air-Operated Controllers, offers better control of difficult processes than ever before. The 500W features:

1. **Wider proportional band** allows control of difficult processes without cycling or instability. Choice of two band-width ranges from 1% – 200% or 2% – 400% of chart width, adjustable by user. Choice can be made by the user – no extra parts, no special tools, no calibration required.
2. **Increased stability,** without loss of sensitivity, for smoother control. New internal stabilizing elements insure freedom from short-period oscillations.
3. **Wider reset response** range to eliminate offset or droop errors in control. Standard reset rate of 0.1 to 10 repeats per minute or fast reset rate of 1 to 300 repeats per minute are available.
4. **Increased derivative range,** for better response to changing variables. Derivative time adjustable from 0.2 to 20 minutes. Bristol's exclusive zero derivative setting facilitates adjustment of controller to process.
5. **Fixed links and levers** give built-in calibration for greater accuracy, no misadjustment, low maintenance.

You'll find Bristol's widened line of Series 500 Air-Operated Controllers more than ever adaptable to your control problem – whether for controlling pressures, liquid-level, flow, temperature, motion, speed, pH, electrical values, or other variables. Why not get all the facts on these instruments? Write The Bristol Company, 120 Bristol Road, Waterbury 20, Conn. 5.35

BRISTOL'S

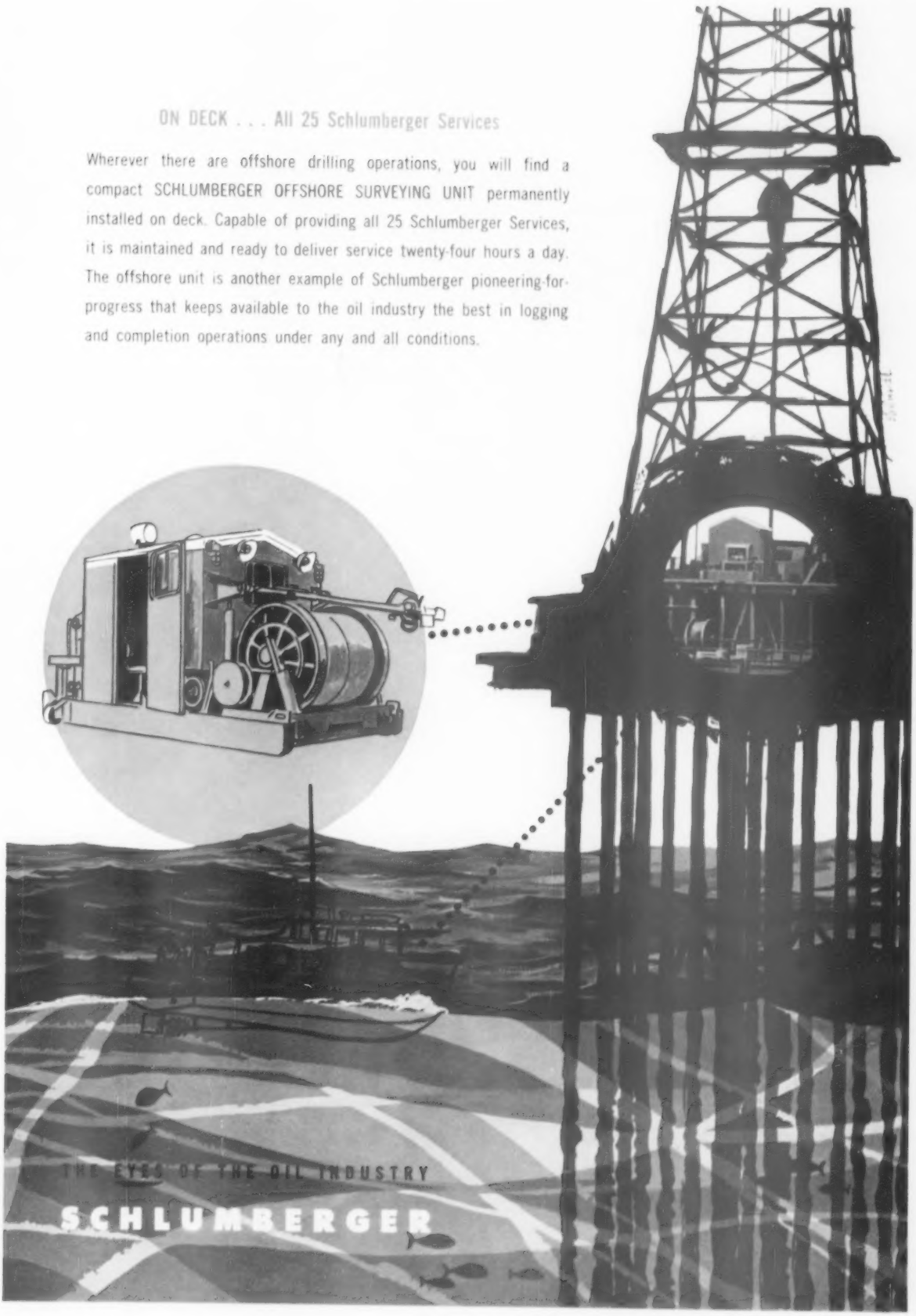
BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

ON DECK . . . All 25 Schlumberger Services

Wherever there are offshore drilling operations, you will find a compact SCHLUMBERGER OFFSHORE SURVEYING UNIT permanently installed on deck. Capable of providing all 25 Schlumberger Services, it is maintained and ready to deliver service twenty-four hours a day. The offshore unit is another example of Schlumberger pioneering-for-progress that keeps available to the oil industry the best in logging and completion operations under any and all conditions.



Roughnecks...

Did you ever watch a good team of roughnecks in action? They make the orderly racking of the long sections of drill pipe and the handling of other heavy "pig iron" look easy. When the replacement of a dull bit interrupts the quest for pay sand, they're hustling: hoisting, disconnecting and racking drill pipe to get a new bit back on bottom and start making hole again—for "making hole" is making money and every minute saved in other operations is money saved, and a lot of it. That's where the skill and teamwork of good roughnecks make the difference.

The Texas Company

TEXACO

Delivers 40% more horsepower

—reduces number of belts needed

—reduces the matching belt problem

—has longer service life

This is the belt designed to enable oil men to get more work out of a drive – with lower V-belt costs, longer sheave life *and* lower V-belt drive costs.

The U.S. Royal Super-Service V-belt delivers 40% more horsepower than a general duty belt. *It also absorbs greater shock loads.* Because of its greater strength, it reduces the number of belts required to use stock sheaves, puts less weight on shaft. Any V-belt drive that is a "tough drive" needs this belt.

U.S. Royal Super-Service Belt is heat- and oil-resistant. Excess stretch has been worked out mechanically before the belt leaves the factory – without loss of elasticity.

For a powerful weapon in the fight against ever-rising production and maintenance costs, specify U.S. Royal Super-Service V-Belts. Their distinctive red color makes identification easy, guards against replacement by standard belts. Get Super-Service Belts from field and supply stores or through any of the 27 "U.S." District Sales Offices. Or write us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber

Ray Fleming, distributor representative, busy handling supply requirements around the clock, cat-napped in his car when he could.

It Pays To Sleep On The Job . . .

When you're setting up one of Louisiana's largest rigs, night and day service from your independent distributor . . . keeps your ante low.

For nearly a month, Ray Fleming was on hand around the clock. During the day he was busy working with the tool pusher as new rig equipment was assembled and erected. At night he slept in his car at the rig to handle emergency requirements.

The rig went up rapidly and started drilling. Towering 147 feet above the alligator-infested marshlands of Louisiana's Grand Chenier Field in Cameron Parish, it is powered with 1,500 hp and equipped to drill to 20,000 feet. Today the rig is searching for rich reserves in one of the fastest developing oil areas in the country.

From the beginning, Ray realized he was the anchor man in a race with time to get the rig operating so it could start paying out. When an investment of nearly $1 million in equipment and other starting-up expenses is at stake, any delay is costly.

As the tool pusher points out, you can never be entirely sure you have every piece of equipment for the job until you actually begin setting up. Then you may need an item right away. So the mobile telephone in Ray's car was always ready.

At a word from the pusher, Ray was on the phone with the warehouse of the independent distributor he works for. Quickly and without red tape the order went in. Moments later a delivery truck with the item required from the warehouse was on its way over the oyster-shell roads through moss-hung oaks of Cajun

A swampland skyscraper, this 147-foot high rig is drilling for oil with Pittsburgh Steel's 5-inch OD drill pipe a few miles from the Gulf in southern Louisiana. Equipped by an independent distributor, it is the property of W. T. Burton Industries, Inc.

Getting instructions from the tool pusher on the drilling platform . . .

Without delay the needed part was delivered to the rig by the distributor's truck.

country, and up the plank road to the rig.

The rig and almost all its equipment—including the 5-inch OD Grade E Range 2 drill pipe from Pittsburgh Steel Company—was supplied through the independent. Ray followed through as friend and virtual working partner to see the venture launched successfully.

Once the rig was in operation, this extra service did not stop. Ray no longer had to sleep at the rig, but he kept in touch daily. Like all independents, the distributor Ray works for keeps 24-hour service available 7 days a week for even the smallest item of equipment

This is one story of service. It is typical of dozens being written all the time by representatives from the 141 stores of the independent distributors (at right) who handle Pittsburgh Seamless Oil Country Goods.

Here's why drillers get a bonus from Mr. Independent Distributor: The independent concentrates his services where he can do a thorough job, rather than spreading them out thinly over big areas. He's a local man, a personal friend of the oilmen he serves. He has a working knowledge of their problems. He can anticipate their requirements.

Because his organization is small and not run by remote control, he gets answers to big problems fast and rushes deliveries with the least paper work. Yet his business is large enough to command a broad selection of the best oil field equipment available.

His overhead is low. So the extra service he can offer comes at no extra cost. He knows how to meet and beat competition, both price-wise and service-wise. His livelihood depends on it. And the return he makes stays right in the locality where he operates.

Pittsburgh Steel Company has no financial interest in any of these distributors. Yet it backs them with more than a half century of experience and know-how in production of seamless oil country goods. It gives them the kind of quality and technical assistance they depend on for reliable service to their customers.

Next time you need a string of drill pipe, casing or oil well tubing, get the pipe of your choice through the distributor of your choice! Specify Pittsburgh Seamless!

Distributor Home Offices

Bradford Supply Company
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

Norvell Wilder Supply Company
P. O. Box 4145
Beaumont, Texas

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

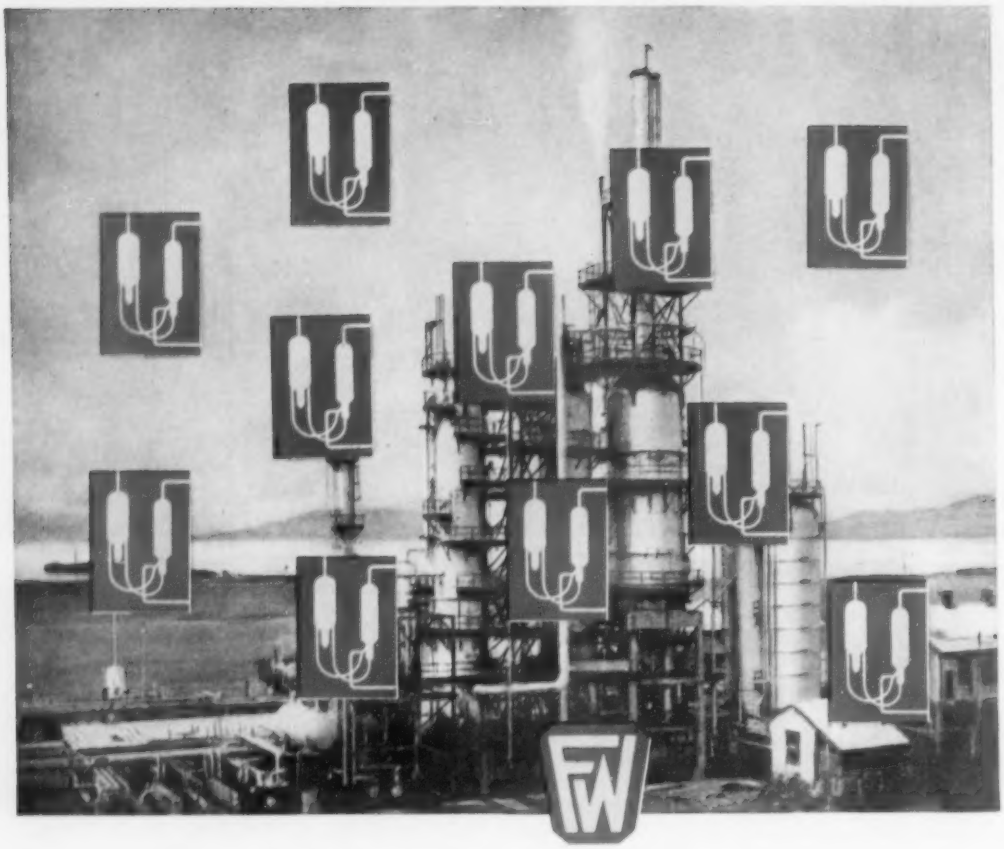
Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES: Atlanta • Chicago • Cleveland • Columbus • Dallas Dayton • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh San Francisco • Tulsa • Warren, Ohio. PLANTS: Monessen, Pa. • Allenport, Pa. Akron • Los Angeles • Warren, Ohio • Worcester, Mass.



eleven

Model IV Fluid Catalytic Cracking Units... by Foster Wheeler

THE Model IV Fluid Catalytic Cracking Process, developed by The Esso Research and Engineering Company, is in operation throughout the worldwide petroleum industry. Foster Wheeler has designed and constructed Model IV plants in Canada, India, France, Australia, The Philippines and Indonesia.

This FW know-how in fluid catalytic cracking process design and construction can help you get higher octane fuels on stream faster, at lowest possible cost. We will be glad to quote on your requirements. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT

AMERICAN IRON & MACHINE WORKS CO.
MANUFACTURERS OF OIL FIELD EQUIPMENT
A
OKLAHOMA CITY U.S.A.

Installed any place . . . any time! All necessary equipment for installation and removal of hand-applied Straight Grip tool joints is brought to your rig or yard . . . saving you trucking expense and valuable down time.

You save many ways when you invest in

AMERICAN IRON

Straight Grip

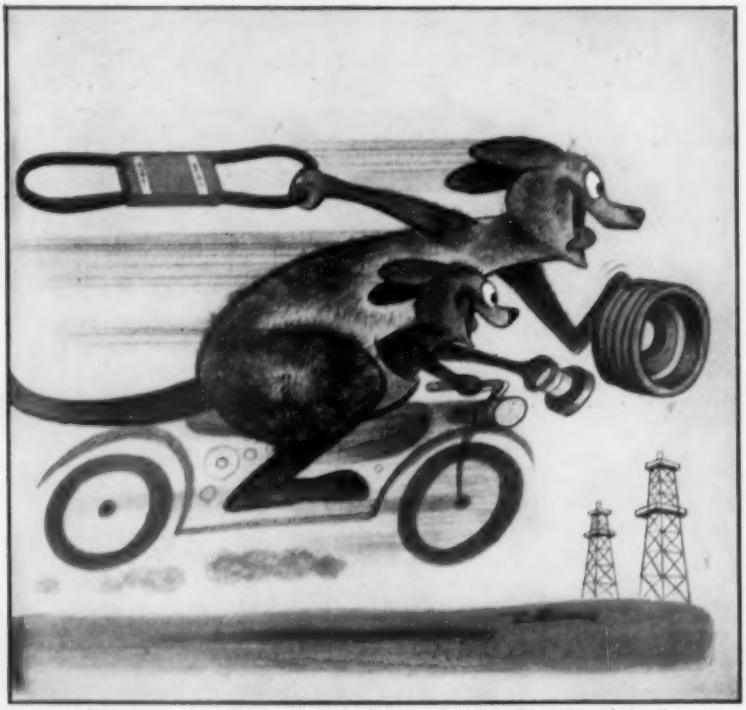
TOOL JOINTS

● Four points of seal! ● Three times as strong as the pipe they connect! ● The higher the tension load and pump pressure . . . the tighter the seal!

AMERICAN IRON & MACHINE WORKS COMPANY, INC.

Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

When we say quick delivery, we mean *quick delivery!*



"Here comes your Worthington QD Sheave — the original two-piece design."

We're talking about the speedy service you get when you order a Worthington QD sheave or V-belt from your local Worthington distributor (or supply store). He's got a dollar-saving way of getting you exactly what you want — *when you want it.*

QD, by the way, stands for Quick Detachable, which the Worthington sheave certainly is. The original two-piece sheave, it's also easy to get on and stays *tight* on the shaft.

Ask about Worthington QD sheaves and belts next time you stop by your supply store. MV.5.8

WORTHINGTON

Buy These Worthington Standard Products From Your Local Distributor

COMPRESSORS • MULTI-V-DRIVES
VARIABLE SPEED DRIVES • PUMPS

NICOLET ASBESTOS PIPELINE FELT RESISTS CORROSION BY PROTECTING ENAMEL COATINGS

FIGHT PIPELINE CORROSION WITH ANY OF THESE NICOLET FELTS

- ★ Nicolet 15 lb. *Asbestos* Felt, Tar or Asphalt Saturated
- ★ Nicolet 15 lb. *Asbestos* Felt, parallel glass yarn reinforced, Tar or Asphalt Saturated
- ★ Nicolet 15 lb. *Asbestos* Felt, Perforated on Uniform Centers, Tar or Asphalt Saturated
- ★ Nicolet "Tufbestos" 8 lb. *Asbestos* Felt reinforced with parallel glass yarns, Tar or Asphalt Saturated
- ★ Nicolet "Reflecto" 8 lb. or 10 lb. White Neoprene Treated *Asbestos* Felt, glass yarn reinforced

Asbestos is *inorganic.* We believe this *inorganic* material, which comprises the major contents of the base felt, provides a longer-lasting shield protection for all pipeline enamel coatings.

Write for your copy of the new Nicolet Catalog
ALL INQUIRIES WELCOME

Photo showing Nicolet Felt Protecting Pipeline

The Felt With a Future

MANUFACTURED BY:
NICOLET INDUSTRIES, INC.

70 PINE STREET
NEW YORK 5, N. Y.

They Say—

Dinosaurs by Mail

Dear Sir:

Here it is Saturday and all is quiet here at the office. My staff (all of her and the shipping clerk) are at home making wassail or whatever folks with homes do over the weekends. So this is a good opportunity for me to answer your nice letter.

FRAGILE
DINOSAURS
HANDLE WITH CARE

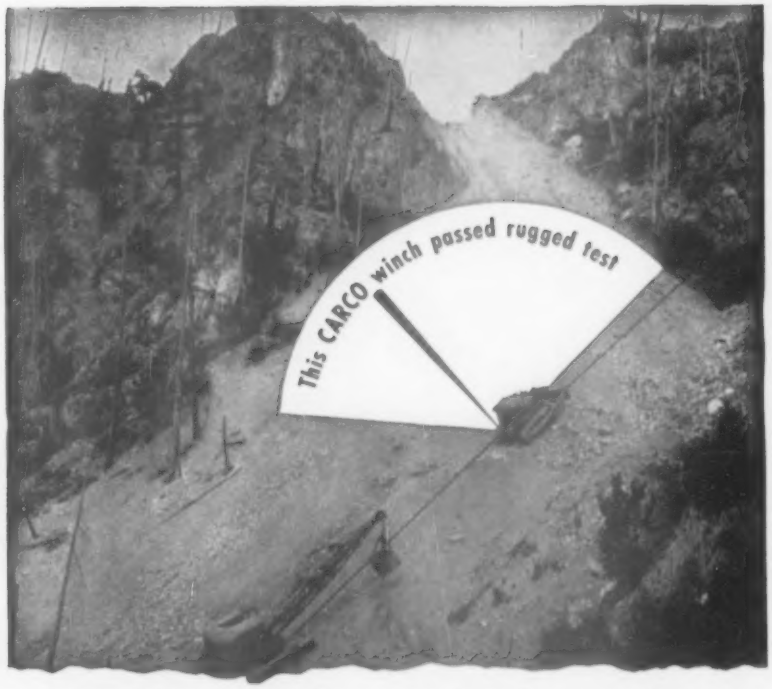
The dinosaurs are a long story. Starts back when I was a little feller maybeso 5 or 6 years of age and my daddy would take me to the museum of a Sunday and show me the collections of ancient animals. Always was interested in these lizards but just in a general sort of way. Came back from the U. S. Marine Corps after World War II . . . and went into the Humidifier, Dehumidifier and Bendix Aviation, Friez Instrument Division, Weather Bureau Instruments business.

About this time I got married . . . I added a mail order side line to my humidifier business selling all sorts of things. A couple of years ago I found a man making nine metal dinosaurs for museum gift shops and I started to sell them by mail. My manufacturer would not risk adding new animals to his line so I hunted literally all over the world and finally located a man in Japan who would cooperate with me.

So now I work closely with the Jap. I design them and do all the technical work here. He makes up models and samples, sends them to me. I o.k. or suggest changes, place my order and lo and behold about a year or so from starting date a new dinosaur is born.

Last year we placed the first three on the market and managed to break even on them. So we figured that we would put out the set of seven in time for Christmas this year . . . By the time the samples and corrected samples went back and forth, we missed the boat. Three dinosaurs are here . . . four other models are due the 28th of December. . . .

Howsoever, we are going to push



CARCO winches held fast when slippage meant disaster

... on tough Alberta to Vancouver pipeline job

Towing and holding heavy equipment on steep grades is a severe test of a winch brake. On the Model J Carco winch, the automatic, self-energizing brake will hold any load the winch can pull. It takes hold the instant tractor clutch is disengaged. Full braking power comes from high ratio leverage contracting the band on brake drum. Brake unit is reversible, permitting under- or over-wind free-wheeling. Brake release mechanism gives the operator complete load control at all times. The load can be checked at any point and even be "inched" down. Brake is enclosed, protecting it from the elements or external abuse.

Mr. G. T. Guest, Assistant to Project Manager of Comstock Midwestern, Limited, builders of "Big Inch-by-Inch", says, "The job needed Carco winches for towing and holding heavy machinery on steep grades and even for holding men by life lines. Had a single winch failed, men and machinery would have been lost. We found Carco winches equal to everything we asked of them."

On top of hill a Model J Carco winch is winching the Carco J winch and International TD24 shown above up steep slope at Coquihalla Canyon while it, in turn, is winching up clam digger.

You can expect greater value from the leading producer, and get it from Carco, first in winch production. PACIFIC CAR AND FOUNDRY COMPANY, Renton, Wash. Branches at Portland, Ore., and Franklin Park, Ill.

50th ANNIVERSARY
PACIFIC CAR AND FOUNDRY COMPANY

CARCO®

WINCHES
FOR ALL INDUSTRIAL TRACTORS

NOW- Available for HIGH PRESSURE SERVICE

VAREC

fig. 2500C

AUTOMATIC TANK GAUGE

Service in working pressures to 300 p.s.i.g. is offered by the new VAREC Figure 2500C Automatic Tank Gauge. It's a high pressure model of the successful VAREC Figure 2500 Series, equipped with the Neg'ator motor, which eliminates use of counterweight and simplifies installation. This series has been tested by 3 years of service in the Petroleum and Chemical fields, after 2 years of experimental and development work.

An important part of this new model is the magnetic drive, which requires no packing gland or mechanical seal on rotating shaft. The use of stainless steel ball bearing construction throughout provides a combination that reduces friction to a minimum.

Liquid level indication on a mechanical counter and dial for convenient, easy reading. Components are enclosed in a separate compartment to keep tank vapors from fogging dial. Operation checker is standard equipment.

All the field-tested, desirable features of the VAREC Figure 2500 Series have been incorporated in this new gauge for high pressure service — the Figure 2500C.

Varec

VAPOR RECOVERY SYSTEMS COMPANY
2820 North Alameda Street
Compton 1, California

961-9

Cable address: VAREC COMPTON Calif. (U.S.A.) All Codes

them right through the year hoping we can break even and pick up a following.

Note the new shipping label (see above). We think even the most case hardened package handler will treat a box labeled dinosaur with respect.

Franklin C. Wertheimer
Chief Dinosaur Herder
Abbeon Supply Co.
Jamaica, N. Y.

Taxes in Wyoming

"RE FINAL PARAGRAPH ARTICLE TITLED QUOTE OIL TAX CRY REVIVED UNQUOTE PAGE 131 DECEMBER 26 EDITION OIL AND GAS JOURNAL PLEASE BE ADVISED WYOMING'S OIL INDUSTRY PAYS 35 PER CENT TOTAL TAXES IN STATE ONLY INSTANCE IN ENTIRE U. S. WHERE OIL PRODUCTION TAXED 100 PER CENT OF VALUATION ON AD-VALOREM BASIS.

"YOUR ARTICLE EXCEEDINGLY MISLEADING AND INCORRECT SINCE WYOMING OIL PRODUCTION'S TAXABLE VALUATION MORE THAN 200 MILLION DOLLARS FOR 1955. DO YOU CONTEND THIS MEANS WYOMING HAS NO TAX ON NATURAL RESOURCES? APPRECIATE CORRECTION OR CLARIFICATION NEXT EDITION."

ROBERT H. MARTIN, CENTRAL DIVISION MANAGER, ROCKY MOUNTAIN OIL AND GAS ASSOCIATION.

Editor's Note: The Journal article dealt entirely with a campaign to impose a severance tax in Wyoming and was not intended to be confused with the state's ad-valorem tax structure.

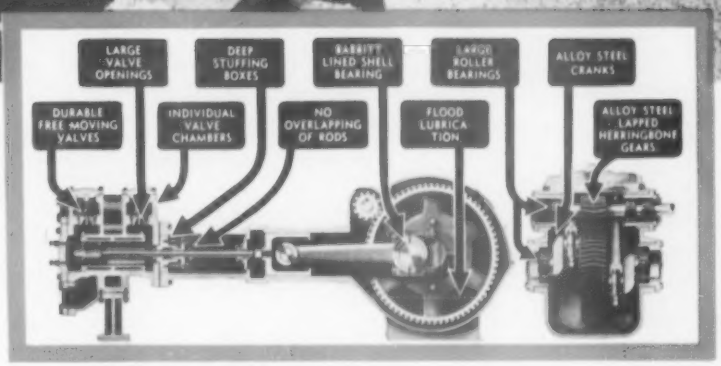
Peculiar Problems

"Many of our problems today are the problems of plenty—surpluses and diets to shrink the waistline—traffic bottlenecks and the decision as to which new car to purchase — jam-packed stores and the question of how Santa Claus will be able to shoulder such a big bundle of Christmas presents . . .

"One factor in particular encourges me—a recent survey of business capital expenditures for '56 . . . This survey indicates that new plant and equipment expenditures estimated for the first quarter of 1956 will be at the annual rate of 12 per cent over the record year now closing.

"Such a clear demonstration of the momentum of prosperity is the result of business confidence in the future. And I may add here that in our delicately balanced economy when we shake the confidence of either the customer or

ASSURANCE STARTS WITH DESIGN



Gaso Design is the product of 40 Years' SPECIALIZATION

To understand the unique position Gaso holds in the field of portable pumping units, consider this: We've been specializing in oil-industry pumps since 1916. Never in that period have our engineers relaxed their study of oil-industry needs and conditions, their program of testing and research, or their policy of applying the latest metallurgical and technical advances to the pumps they design. There isn't a nut, bolt, part or unit of a Gaso Pump that has escaped the ceaseless search for improvement.

Wouldn't it be surprising, under such conditions, if we didn't produce pumps that outperform any other pumps in their capacity range?

GASO PUMP & BURNER MFG. CO. TULSA, OKLAHOMA
EXPORT OFFICE: 149 Broadway, New York

Be Sure With

GASO PUMPS
for every oil industry need

DISTRIBUTORS
W. L. SOMNER COMPANY, Shreveport, Louisiana • Odessa, Texas
Tinsley, Mississippi • Brookhaven, Mississippi
POWER PUMPS, INC., Long Beach, California
PEDDLERS, INC., Houston, Texas
PUMP ENGINEERING CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming
LUFKIN MACHINE CO., Ltd., Edmonton, Alberta

NEW... HIGH VACUUM PUMP from Refinery Supply

the VIBRATION'S gone

and so is the noise with the HYVAC-7

No. 91505, 60 cy. 115/230 volts
$254.50

No. 91500, same as No. 91505, but without motor or base
$199.50

cenco

The most complete line of scientific instruments and laboratory supplies in the world

Here's a vacuum pump that is so carefully designed . . . so expertly machined . . . so perfectly balanced . . . that vibration has been reduced to an absolute minimum. Result . . . smooth, quiet operation. You can hardly hear it as it runs. In fact, its noise level is lower than that of any similar pump.

The new Cenco Hyvac-7 has more pumping capacity per cubic foot of space occupied than any other vacuum pump now available. It produces a free air displacement of 70 liters per minute and a guaranteed ultimate vacuum of 0.1 micron. This pumping speed in the low micron range is exceptionally high. The ratio of pumping speed at 1 micron to that at atmospheric pressure is 49%. And it pumps from atmospheric to ultimate pressure in less than five minutes.

This finest, most efficient of all vacuum pumps is now ready for shipment.

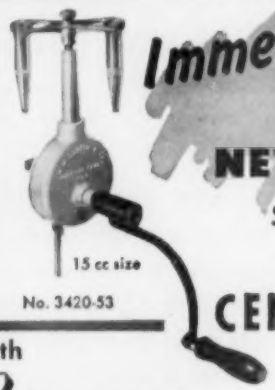
REFINERY SUPPLY COMPANY
621 EAST FOURTH STREET • TULSA 3, OKLAHOMA
2215 McKINNEY AVENUE • HOUSTON 3, TEXAS

CENTRAL SCIENTIFIC COMPANY
1700 IRVING PARK ROAD • CHICAGO 13, ILLINOIS
CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO
SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA

Oil Loans

THE 1ST NATIONAL BANK OF SHREVEPORT

LOUISIANA'S OLDEST BANK



15 cc size

No. 3420-53

Immediate Delivery!

NEW MODEL Series 53 CURTIN CENTRIFUGES

with **7** improvements

Aluminum castings reduce weight one-third to approximately 5-1/4 lbs. . . . Diameter of drive shaft increased from 7/16" to 1/2" for added strength . . . Gear train redesigned for more efficient operation . . . Both 15 cc and 100 cc sizes use the same crank . . . Spindle shaft ball bearing mounted, easier to turn . . . Drive shaft of corrosion resistant stainless steel . . . Spindle of corrosion resistant stainless steel.

Write for bulletin 53

W. H. CURTIN & CO.
DOMESTIC EXPORT • Established 1928
CURTIN
LABORATORY APPARATUS, FURNITURE & CHEMICALS
HOUSTON • NEW ORLEANS
BIRMINGHAM • CORPUS CHRISTI • TULSA

the businessmen, we risk fracturing the very base on which we stand."

Sinclair Weeks, Secretary of Commerce, in address before sixtieth National Association of Manufacturers' congress of American industry.

Emphasis on Cost

"Even though personal income and employment figures stand at all time highs, the consumer's desire 'to shop around' is being felt in the production line, in warehouses and, at the raw-materials source. Consumers who have made clear they will buy 'at the right price' have germinated a cost-consciousness on the part of industrial management not apparent for almost two decades."

George Spatta, president, Clark Equipment Co., in year-end statement.

Mayors' Position Cleared Up

"Your victory clearly shows that the highly influential American Mayors Association is not opposed to the Harris bill. This is especially important in view of the preconvention clamor set up by a small group in its futile effort to convey the false impression that most of the nation's civic leaders oppose the measure.

"Despite this clear rebuff, a handful of demagogues is proceeding with plans to set up a Washington lobby and create the illusion that the nation's mayors are united in opposition to the Harris bill. It is vital, therefore, that you continue to provide the leadership so necessary to discredit this misrepresentation."

Mayor M. D. Bryant, San Angelo, Tex., in letter to Mayor Alex M. Clark of Indianapolis.

Skeleton in the Closet?

"Recent reports in the trade press give the impression that there is considerable merit to many of the statements of importers that restriction of imports will bring higher prices for petroleum products.

"Since the statement of Dr. Flemming that imports from the Middle East are about 7 per cent too high, it would appear that the producers are now in a position to devote their efforts to a more important phase of their apparently well-planned program, namely, raising the price of domestic crude oil.

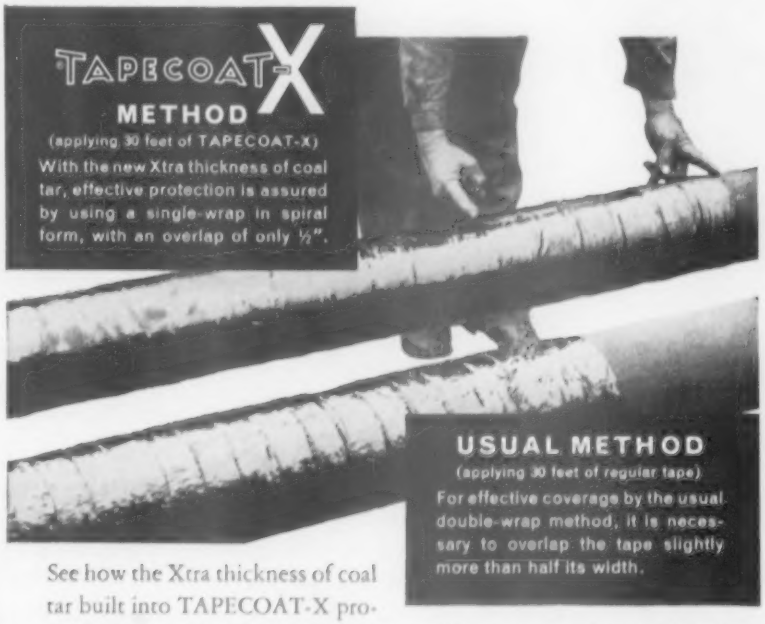
"Preliminary steps toward this end were undertaken at the recent meeting of the independent Petroleum Association of America in St. Louis . . . Considerable emphasis was placed on the rise in production costs for domestic crude oil and natural gas.

"With the assured assistance of the

For XTRA COVERAGE

Specify TAPECOAT-X

. . . the time-tested quality coal tar coating in tape form . . . now made with Xtra thickness of coal tar to go farther, faster *on pipe, pipe joints, fittings, mechanical couplings, tanks and other surfaces vulnerable to corrosion.*


TAPECOAT-X METHOD
(applying 30 feet of TAPECOAT-X)
With the new Xtra thickness of coal tar, effective protection is assured by using a single-wrap in spiral form, with an overlap of only ½".
USUAL METHOD
(applying 30 feet of regular tape)
For effective coverage by the usual double-wrap method, it is necessary to overlap the tape slightly more than half its width.

See how the Xtra thickness of coal tar built into TAPECOAT-X provides extra protection per foot of tape. This extra thickness of coal tar, made possible by a new exclusive process, permits a single-wrap application that can be applied faster and over a greater area for savings in labor, material, time and money.

These and other practical advantages make it worth your while to get the complete details on TAPECOAT-X.

Write for literature today

The TAPECOAT Company
ORIGINATORS OF COAL TAR COATING IN TAPE FORM

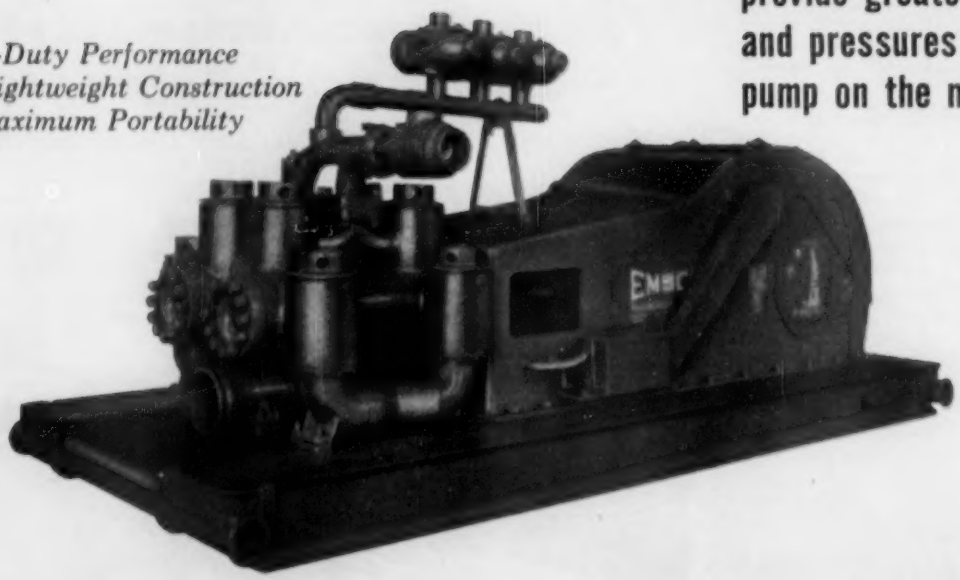
1539 Lyons St., Evanston, Illinois

FROM ANY STANDPOINT YOU'LL FIND EMSCO

SLUSH PUMPS

Heavy-Duty Performance with Lightweight Construction and Maximum Portability

provide greater volumes and pressures than any pump on the market!



1 Fabriform construction of the power end, originated and developed by EMSCO, uses steel plates and shapes instead of bulky, heavy iron castings and provides a light, rigid frame.

2 Wide-faced, forged steel, heat-treated herringbone gears provide quiet and efficient speed reduction.

3 EMSCO's patented "exposed" liner design eliminates all fluid washouts caused by liner packing failure since the slightest leak may be detected immediately.

4 Operation and maintenance are simple and easy. There are no adjustments to be made, no greasing to be done. Lubrication is completely automatic.

5 Fluid end is of 8-pot design, with each valve in a separate pot or valve chamber. Threaded valve-pot covers provide quick and easy access to valves—reduce bulk and weight.

6 There's an EMSCO Slush Pump for every pumping need—six models: D-175, D-300, DA-500, D-700, D-850 and D-1000. Call your EMSCO representative for full information.

EMSCO

REG. U. S. PAT. OFF.

EMSCO MANUFACTURING COMPANY

Garland, Tex. • LOS ANGELES, CALIF. • Houston, Tex.

General Sales Offices: Dallas, Texas

Distributors: Bovaird Supply Company, Tulsa, Oklahoma
Mid-Continent Supply Company, Fort Worth, Texas
Export distributor: Mid-Continent Supply Company, Inc., 45 Rockefeller Plaza, New York 20, N.Y.

SP-602

THE BEST WAY TO LOWER

OPERATING COSTS.... LOWER A REDA PUMP INTO YOUR WELL

With investment and labor costs continuing to increase, economy of operation is of paramount importance in producing wells with decreasing oil-water ratios.

Reda-Submergible Pumps are an economical means of producing wells with high fluid volume. Over 80 million barrels of oil have been produced to date from wells previously unprofitable to operate. Not only has production increased, but pumping with Reda extended the ultimate economic life of thousands of wells previously produced at low rates of fluid withdrawal.

Sizes are available to 300 h.p.; capacities from 20 bbls. to 25,000 bbls. per day; depths from 200-feet to over 10,000-feet. Easier, less expensive installation, low operating costs, increased production, greater operating life, and efficient performance lower costs when pumping with Reda.

Write today for further information. Reda engineers will be pleased to furnish complete information.

SIGN OF QUALITY . . . SUBMERGIBLE REDA PUMPS

REDA

PUMP COMPANY

BARTLESVILLE, OKLAHOMA

state regulatory bodies, who have the authority to limit production to demand, and of the trade press, who seem willing to pick up the ball and run with it, the possibility of an increase in the price for domestic crude oil would appear less remote.

"This is particularly true now that there has been an official suggestion for a reduction in imports. After all, imports represent one of the principal competitive forces on the price of domestic crude oil."

Editorial in November issue of Empire State Petroleum Association.

CALENDAR

JANUARY

25-26 Northwest Petroleum Association, annual convention, Nicollet Hotel, Minneapolis.

25-27 Eleventh annual Symposium on Instrumentation for the Process Industries, Memorial Student Center, A. & M. College of Texas, College Station, Tex.

26-27 Fifth Annual Instrument Short Course, Los Angeles Harbor Junior College, Wilmington, Calif.

FEBRUARY

15-17 National Association of Corrosion Engineers Short Course for Pipeliners, Mayo Hotel, Tulsa.

19-23 American Institute of Mining and Metallurgical Engineers, annual meeting, Hotel Statler, New York City.

24 Natural Gasoline Association of America, Permian Basin meeting, Lincoln Hotel, Odessa, Tex.

26-29 American Institute of Chemical Engineers, Statler Hotel, Los Angeles.

27-29 American Association of Petroleum Geologists, Rocky Mountain Section Auditorium, Denver.

MARCH

1-2 Southern Gas Association, transmission management conference, Jung Hotel, New Orleans.

7-9 American Petroleum Institute, Division of Production, Southern District meeting, Plaza Hotel, San Antonio, Tex.

12-16 National Association of Corrosion Engineers, annual convention, Statler Hotel, New York City.

19-21 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

21-23 American Petroleum Institute, Division of Production, Southwestern District meeting, Texas Hotel, Fort Worth.

24 North Texas Oil and Gas Association, annual meeting, Wichita Falls, Tex.

APRIL

3-5 Annual Corrosion Control short course, University of Oklahoma Extension Study Center, Norman, Okla.

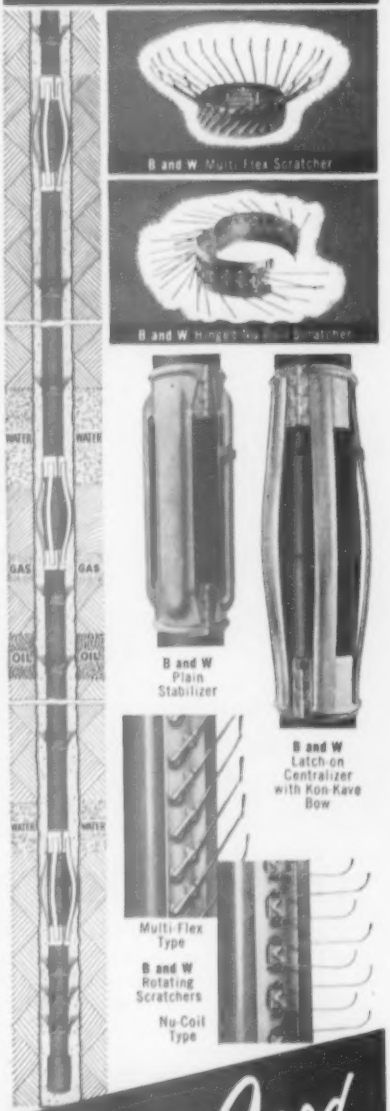
4-6 American Gas Association, general management conference, Conrad Hilton Hotel, Chicago.

4-6 American Petroleum Institute, Division of Production, Mid-Continent District meeting, Broadview Hotel, Wichita, Kans.

8-13 American Chemical Society, general meeting, Dallas.

9-10 Texas Petroleum Research Committee, Ninth Oil Recovery Conference (Symposium on Natural Gas in Texas).

B and W SCRATCHERS AND CENTRALIZERS


B and W Multi-Flex Scratcher
B and W Plain Stabilizer
B and W Latch-on Centralizer with Kon-Kave Bow
Multi-Flex Type
B and W Rotating Scratchers
Nu-Coil Type

For a Good Cement Job

Positive Mud Removal and Complete Cement Fill

B and W Inc.

Well Completion Specialists

GULF COAST
Box 5266
Houston 12, Texas
Phone WA-3-6603

WEST COAST
Box 3751
Los Angeles 54, Calif.
Phone DA-4-1106

Southwest

PACKAGED COMPRESSOR PLANTS

M. L. Mayfield Company's Packaged Compressor Plant, Pine Prairie Field, Easton, Louisiana. Equipped with two Southwest—Cooper-Bessemer 440 H.P. GMX 8-TF Eight-Cylinder, Two-Cycle, gas engine driven compressors.

FLARE GAS FOR GAS LIFT

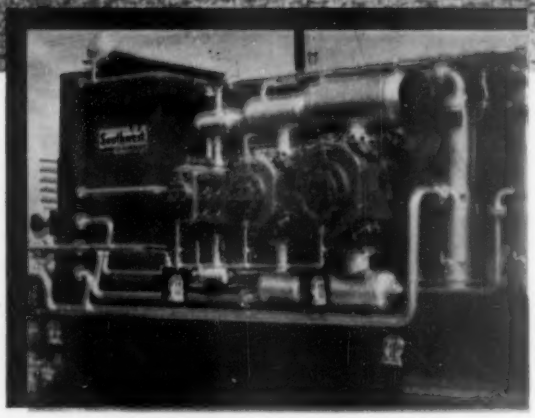
Gas pressure from wells was too erratic and too low for gas lift. But, after the installation of two 440 H.P. Southwest Packaged Compressor plants, this field gas was put to work at gas lift, and there was a surplus to sell.

These Southwest units have three stages of compression, raising the field gas from 30 to 750 psig for gas lift or to 1,000 psig to feed into a sales line.

Instead of one large unit, these two were installed to assure continuous field operation. Each unit is equipped with variable unloading equipment. Any condition that will be encountered in their operation, from one unit handling gas lift to both units operating for gas lift and sales gas, can be handled easily.

Automatic controls allow the units to run unattended except for routine servicing as a part time job of one man.

Southwest Packaged Compressor plants have lower installation cost than a conventional plant plus almost complete salvagibility if the plant should be relocated.



SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773, Houston 7, Texas

Texas A. & M. College, College Station, Tex.

11-13 Natural Gasoline Association of America, Texas Hotel, Fort Worth.

14-15 Southern Gas Association, conference on use of electronic computers by engineering personnel, Hilton Hotel, El Paso.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel & Club, Boca Raton, Fla.

15-17 Texas Independent Producers and Royalty Owners Association, Statler Hilton Hotel, Dallas.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

18-20 American Petroleum Institute, Division of Production, Rocky Mountain District meeting, Cosmopolitan Hotel, Denver.

18-20 National Petroleum Association, semiannual meeting, Cleveland Hotel, Cleveland, Ohio.

19-21 Gas Appliances Manufacturers Association, annual meeting, The Greenbriar Hotel, White Sulphur Springs, W. Va.

23-25 Southern Gas Association convention, Dallas.

23-26 American Association of Petroleum Geologists and Society of Economic Paleontologists, annual meeting, Conrad Hilton Hotel, Chicago.

25-27 American Petroleum Institute, Division of Production, Eastern District meeting, Deshler-Hilton Hotel, Columbus, Ohio.

25-29 World Oil Exposition, Houston.

30 May 1 Independent Petroleum Association of America, semiannual meeting, Statler Hotel, Los Angeles.

30 May 4 American Petroleum Institute, Safety and Fire Prevention midyear meeting, Warwick Hotel, Philadelphia.

MAY

6-9 American Institute of Chemical Engineers, Roosevelt Hotel, New Orleans.

10-11 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-11 American Gas Association, Gas Supply, Transmission, and Storage Conference, Conrad Hilton Hotel, Chicago.

14-17 American Petroleum Institute, Division of Refining, midyear meeting, Montreal.

16-18 American Gas Association, Chemical, Engineering, and Manufactured Gas Production Conference, Benjamin Franklin Hotel, Philadelphia.

17-18 Rocky Mountain Petroleum Sections, joint meeting, Gladstone Hotel, Casper, Wyo.

24-25 Natural Gas and Petroleum Association of Canada, Sheraton Brock Hotel, Niagara Falls, Ont.

JUNE

17-22 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Atlantic City, N. J.

24-25 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que.

SEPTEMBER

11-13 Pacific Coast Gas Association, annual meeting, Coronado, Calif.

OCTOBER

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

ROCKWELL-BUILT

Edward VALVES

FOR LOW COST- *High Performance*

Edward STOP VALVES Cut Maintenance Costs

In steam, water, oil, gas or chemical services Edward stop valves have long, trouble-free life built right into them. When you install Edward stop valves, you will reduce maintenance costs; cut replacement inventories; get longer, more dependable service. Always specify Edward. "Only Edward Valves Equal Edward Quality and Performance."

FIG. 2698

FIG. 444

YOU GET THESE "Plus Values"

- Interchangeability of parts reduces inventories;
- Forged steel bodies, bonnet, yokes add extra strength;
- Stainless stems resist corrosion;
- Hardened stainless seats and disks last longer;
- Swivel disks prevent seat galling;
- Large handwheels ease operation;
- Swing gland bolts aid easy repacking; and
- Positive backseats permit packing under pressure.

EDWARD FORGED STEEL STOP VALVES

RATINGS* to 2000 lb WOG or 850 lb at 750 F

SIZES: ¼, ⅜, ½, ¾ and 1"

Fig. 444—Globe—OS&Y—union bonnet—screwed or welding ends

Fig. 445—Angle—OS&Y—union bonnet—screwed or welding ends

Fig. 2698—Globe—inside screw—union bonnet—screwed or welding ends

Fig. 2699—Angle—inside screw—union bonnet—screwed or welding ends

SIZES: 1¼, 1½ and 2"

Fig. 448—Globe—OS&Y—bolted bonnet—screwed or welding ends

Fig. 449—Angle—OS&Y—bolted bonnet—screwed or welding ends

*Other Edward Stop Valves available with ratings to 7500 lb WOG, 3250 lb at 1100 F

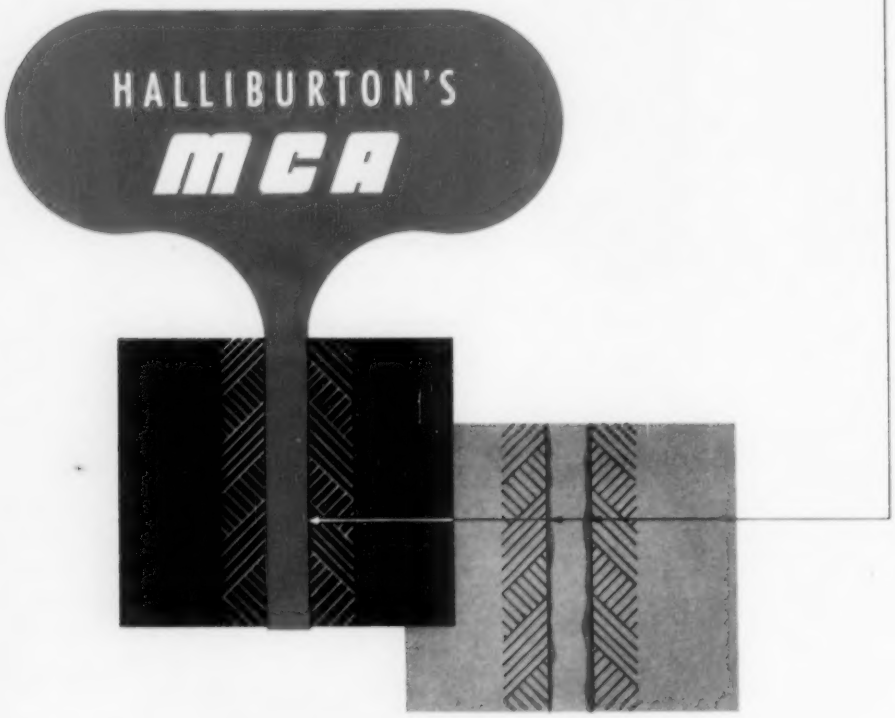
For more details on these as well as other Rockwell-Built Edward forged and cast steel valves write for the Edward Condensed Catalog.

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

1212 West 145th Street, East Chicago, Indiana

BREAKS UP FILTER CAKE FOR BETTER CEMENT BOND



Cement channeling can be minimized with a treatment of Halliburton's MCA prior to cementing. MCA disperses the soft filter cake formed in drilling and thus is designed to remove a major cause of cement channeling.

Field proved MCA is a combination of hydrochloric acid and Morflo, a highly active surfactant. Its action on filter cake softens it so that it may be washed away from the well bore and flushed from the formation. Cement can then be placed with maximum assurance of a complete bond.

In treating, MCA is designed to destroy any existing water block which might retard the flow of oil, and it is capable of breaking most water-oil emulsions that may occur in a formation. Only small quantities are required, and treatment extends only for one to two hours.

Reduce that trouble-causing filter cake before cementing your next well. Treat it with Halliburton's MCA. Call your local or district office of the Halliburton Oil Well Cementing Company.

COMPLETE DATA SENT ON REQUEST

Get this valuable information for your Halliburton Service File.

HALLIBURTON CHEMICAL SERVICES

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY — Mid-Continent Manager
HARRY B. BULLEN — Representative
D. B. MILLER — Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
CHARLES A. WARDLEY — Eastern Manager
JAMES W. BROWNLEE — Representative
JOHN W. MEANY, JR. — Representative

CHICAGO
105 West Madison Street, CEntral 6-2537
E. S. KLAPPENBACH — Midwestern Manager
DAVID T. KENNEY — Representative
JOHN D. YODER — Representative

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES — Manager

HOUSTON
Sterling Building, CA 4-7726
JOHN M. SPEARS — Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building, STerling 3074
GEORGE O. RUPPERT — Representative

LOS ANGELES
650 South Grand Avenue, VAndike 0722
DONALD O. HANSON — Manager

ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER — European Representative

•

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00; 3 years, $8.00. Single copies: regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1956 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING . . .

Too Busy to Read?

IN case you hadn't noticed it, we'd like to call attention to a recent change in our Table of Contents.

Instead of the time-honored way of listing everything in numerical order from front to back, we now group articles and features by subjects, no matter what part of the Big Yellow Book they are in.

The idea, of course, is to make things easier for the busy reader. We'd like to think that every subscriber reads every page every week, and would find items of special interest no matter how we buried them. But we know better. We know that each individual reader has a primary interest in one particular phase of this complicated industry and wants to read about that first. So this grouping by general subjects or divisions of the industry serves as a sort of a road map to find your way to your destination by the shortest route.

Along with this change we have started adding a little doo-dad or hickey to our major articles on technology and operation—a little black bar with a tag word telling whether the article deals primarily with drilling, refining or whatever.

One reason for this is to benefit those who just thumb the book and don't even take time to look at the Table of Contents. This little typographical gadget will flag a man's attention and show him that this particular piece is down his particular alley.

The other reason is to help people who are so busy that they have their secretaries clip the magazine and file the pages away by subjects in case the boss ever does get around to reading. Now the secretary doesn't even have to be able to read; she can just set up a file drawer for each one of our headings and by matching the characters on our little hickeys with those on her file drawers she can do all the boss' "reading" for him in practically no time at all.

Those who deplore the trend toward automation may see something sinister in this move of ours. It does rather look like a step toward the ultimate mechanization of the process of getting ideas. Looking down the road into the next century, the business magazine of the future may be printed on punch cards instead of type. The office boy will toss the latest issue into the hopper of an electronic sorting machine for future reference. Then when anyone wants to know the latest dope about the geology of Australia, or how to make ethylene from ethane, or whatever, he just punches some buttons and the machine pops out a tabulated answer to his precise question. Think of all the time saved by never having to read anything.

But until that day comes, we'll stick to reading matter and the printed page. And we who make a living by writing and printing hope that you do, too. But we do try to do various little things to make reading faster, easier, and more rewarding for our busy subscribers.

What Price Oil?

SPEAKING of changes, we've made another one in the back of the book, in our Current Statistics section. We've expanded our reporting of prices of crude oil and representative petroleum products in various parts of the world. You'll even find some typical tanker rates there.

The reason for this should be obvious. The oil industry runs on the money taken in from sale of its goods, and its prosperity depends on whether or not it can keep its costs below prices. Prices of one product, or in one locality, may have a big influence on some other prices, or on a shift in competition. Maybe prices and competition don't mean anything in Russia, but just ask any businessman if they're important here.

Naturally we don't pretend to give a complete, detailed market report—that would take pages and pages and pages. We just selected some representative quotations that will give you a key to trends in how the business is doing.

—*Henry D. Ralph.*

one of the *Best Friends* a contractor ever had...

Through the years, suggestions of drilling contractors and drilling department personnel have been of great help in re-designing and improving **BAKER DRILL PIPE FLOAT VALVES** until today they are considered an old and trusted friend in the majority of drilling strings.

This is the Baker Model "F" Drill Pipe Float Valve, Product No. 4813—available at your supply store

WHY THIS "OLD FRIEND" IS WELCOME ON DRILLING RIGS

1. It eliminates plugged bits, and avoids pulling wet strings—no muss or fuss;

2. A "float valve" in the drilling string is mighty cheap insurance in event the drilling string parts;

3. The strong, simple valve is merely dropped into place, either in a recess in the drill collar, or in a Drill Pipe Float BODY at any point in the string;

4. It is easily installed without tools or wrenches, and the inexpensive replacement parts are available at any supply store for servicing right on the derrick floor.

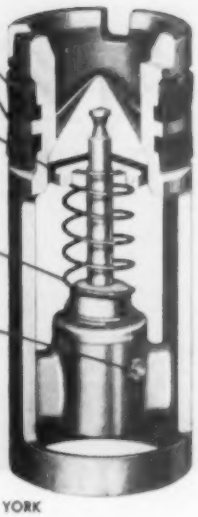
FEATURES

REVERSED SIDE SEALS
prevent distortion of the seals by trapped fluid.

MORE EFFECTIVE SEALING
The re-designed seal between the valve and the valve seat seals better—lasts longer—stays in place even under high circulating volumes and high pressures.

LESS SPRING TENSION
reduces the cutting action of circulating fluid on the valve seal and seat.

GUIDE POSITIVELY ANCHORED
The valve guide is held securely in place by a set screw.



BAKER OIL TOOLS, INC. HOUSTON • LOS ANGELES • NEW YORK

BAKER DRILL PIPE FLOAT VALVE

The Harris bill is a consumers' bill

ONE of the serious misrepresentations of the pending Harris-Fulbright bill is that it would free field prices of natural gas from federal regulation—that it's a "producers' bill."

The fact is that in its present form it is very much a "consumers' bill" and ought to be labeled as such.

The bill gives consumers of gas far, far more protection against excessive, exorbitant, or runaway gas prices than they ever had before. And it does it in a way to encourage producers to increase supplies of gas and to do it efficiently.

It does free producers from direct federal regulation. An individual producer's wellhead price will not be set by the public-utility rate-making formula. But it gives the Federal Power Commission a very real and potent control over the field prices that interstate pipeline companies will pay—which, after all, is what consumers want.

CEILINGS ON FIELD PRICES will be set under FPC's new authority to determine the reasonable market price of gas in the area of purchase. This will apply to both old and new contracts.

The price-escalation provisions in recent supply contracts—the thing that alarmed consumers and distributors the most—are knocked out. Only two relatively minor and unobjectionable types of escalation clauses are permitted. Regardless of what present contracts say, field prices can't possibly rise above what FPC determines to be a reasonable market price.

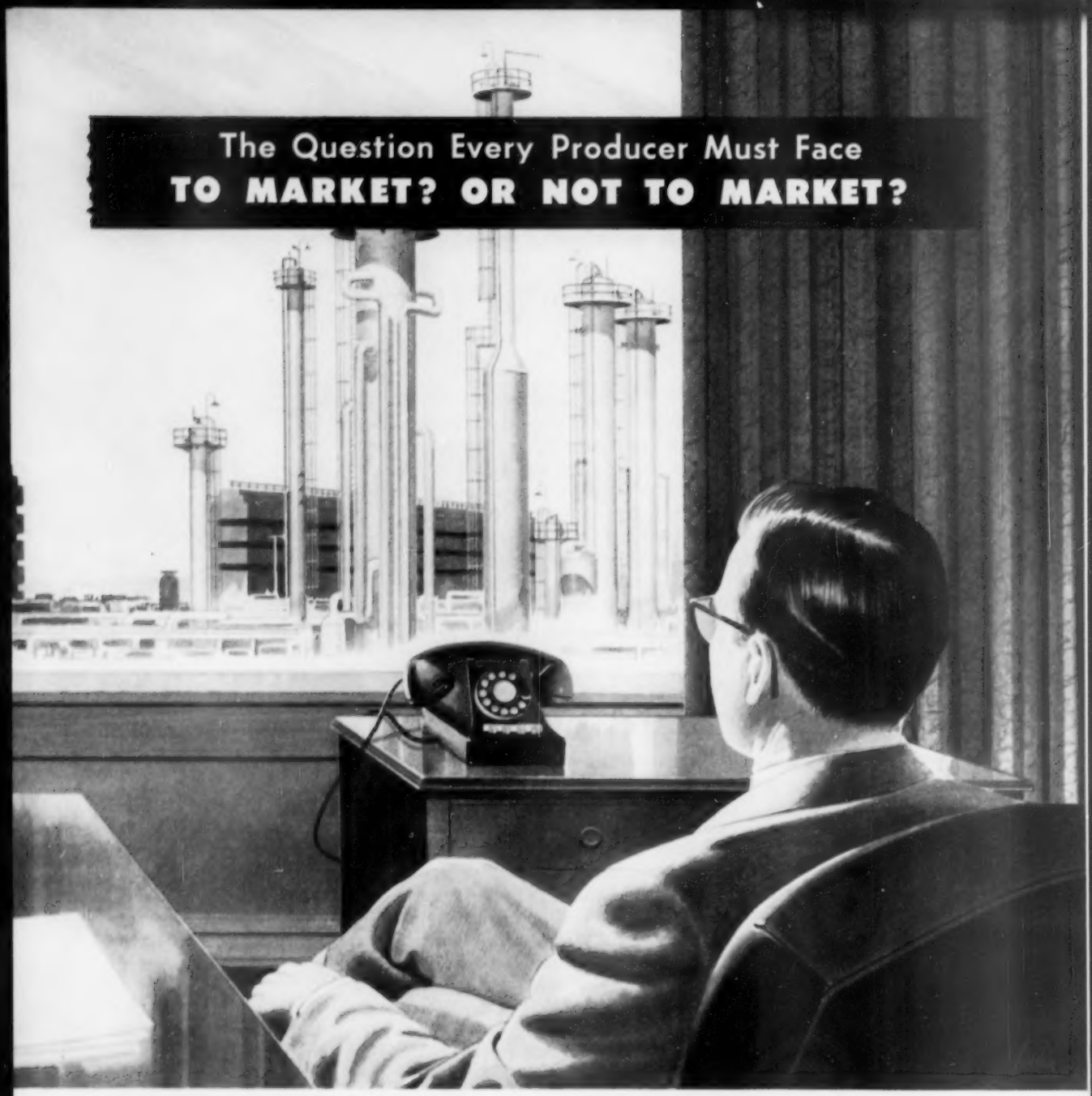
Nor can producers cancel their contracts because the price provisions have been nullified. The "escape clauses" are made illegal. This eliminates another consumer nightmare—the fear of a "producers' strike" that would cut off supplies.

On new contracts, too, FPC will determine the maximum price allowed, and usually before the contracts take effect. Pipelines paying more than the ceiling will not be permitted to collect the excess from their customers—a mighty effective bar to offering high prices.

THESE CONSUMER SAFEGUARDS need to be better explained to persons in doubt or confused about the legislation. They have been lost sight of in the welter of propaganda and false issues.

Die-hard opponents of the bill minimize these safeguards because they want to nullify all provisions of supplier contracts and limit producers' earnings by utility-type regulation. This would discourage efficient operation and reduce the supply of gas.

Producers aren't all happy about the bill's provisions. But they accept it as a compromise they can live under. It gives them leeway to operate under the field-price ceilings to be fixed by FPC.



ANCHOR

CAN DO IT FOR YOU MORE ECONOMICALLY AND AT FAR LESS TROUBLE TO YOU . . .

Your specialty is producing or refining. Your problems are large enough to require your entire attention. Anchor is a specialist in marketing. Anchor men devote all their time and interests to the problems peculiar to their phase of the oil industry. It just stands to reason that you'll be saving yourself a lot of trouble and money if you'll let Anchor do your marketing for you.

Anchor has the physical facilities to do the job: A huge fleet of tank cars which are routed all over the United States; three vast underground storage installations; a nationwide sales organization to keep the products rolling.

Or, maybe, sometimes you need petroleum products? Anchor can readily supply them. So, whether you want to sell, or buy, call Anchor and get the details — Tulsa, CHerry 2-7261.

ANCHOR PETROLEUM CO. • TULSA

SALES OFFICES: Des Moines, Shreveport, Toledo, Houston, Long Beach, Oklahoma City, Midland, Texas, San Francisco, Seattle, Salt Lake City, E. Patterson, N. J., Hattiesburg, Miss., Macon, Ga., Minneapolis, Minn.

Current and significant in . . .

The Industry This Week

Drilling

• **The squeeze of ever-rising costs and lower income** caused by cut-throat bidding really has begun to hurt drilling contractors. In the past they have been able to stay afloat by stepping up their speed in making hole. Contractors now say this no longer will work. The only answer appears to be an increase in footage rates. P. 68.

New trouble is plaguing the world's deepest well on the Louisiana coast. A liner has become stuck 770 ft. off bottom which early last week was extended to 22,570 ft. Decision on further plans now awaits an attempt to cement the liner where it is. P. 86.

Refining

• **Sale of Johnson Oil Refining Co.** may be imminent. Prospective buyer is an independent marketing firm in Indianapolis. It wants Johnson's 6,500-bbl. Cleveland, Okla., refinery plus bulk stations in seven states.

Venezuelan crude may be used to make asphalt in Corpus Christi refinery now being modernized. Company plans to process 3,500 bbl. of heavy crude daily in new unit. Shut-down refinery is due to reopen June 1. P. 71.

Evolution, not revolution, will be the key to auto changes affecting refiners. For the next several years, higher and higher octanes will be demanded. Gas turbines will enter via the luxury car, truck, and bus route. P. 80.

Natural Gas

• **The Harris bill may hit the Senate floor** this week. Backers feel they have the votes to pass it. Opponents say at this stage they can't defeat the measure. Both sides are busily working on a small group of uncommited senators who control the fate of the important bill freeing natural-gas producers from federal controls. P. 67.

Housewives at Minot, N. D., are cooking with natural gas finally. But public officials still argue their positions in the legal snarl which delayed operations over a new pipeline. P. 71.

Pipelines

• **West Coast Pipeline refuses to die.** Texas independents have taken control of the proposed project for an emergency Texas-California crude line. They're offering a piece of it to California operators to quiet their opposition and bolster financing. P. 76.

T.G.T. is going to build a 200-mile line to bring butane across southern Texas to the Pasadena butadiene plant in which it holds half interest. The line also will move propane and natural gasoline in a mixed stream. Products will be separated at the Houston Ship Channel terminus. P. 83.

Southern Pacific is building a 176-mile, 6-in. products system to supply air bases in California and Arizona. Laterals will be laid from the new Los Angeles-Phoenix line. P. 66.

Industry

• **Prospects for a California conservation law** have never been brighter. Credit must go to Richfield, which is sparing nothing in time and money to sell conservation to the public. P. 74.

Atlantic will buy Houston Oil through an intermediate company. New York firm will buy properties, be paid out of production according to present plan. P. 72.

Shell's Spaght: "Half the high schools have no classes in physics or chemistry"

An oil executive ponders . . .

. . . The Shortage of Engineers

"YOU can't let the brooder go cold. If you do, the day after tomorrow you won't have any chickens. That's exactly what's happening."

Monroe E. Spaght, executive vice president of Shell Oil Co., isn't talking poultry. He refers to the secondary education trend in the United States that is turning out fewer and fewer high school graduates aiming at the engineering and scientific professions.

It's a trend viewed with alarm by American industry already hard-pressed to supply itself with technical people in an age that becomes more technical every day.

Spaght, a tall, relaxed scientist who has moved up through the Shell organization from research chemist to head of Shell Development Co. and then to the No. 2 spot in the parent company, talks about the problem with fervor.

He thinks the chemical and oil industries have done much more toward reversing this educational trend than industry as a whole. But, he says, much more must be done. He doesn't think industry generally—and that includes the oil industry—is as alarmed as it should be.

Worst yet to come . . . To support his concern, Spaght cites the fact that colleges and universities today are not supplying industry's demand for engineering and scientifically educated people. He thinks the shortage will get much worse before it gets better.

"This is awfully serious," Spaght says soberly. "The number of people going into universities today to study the sciences is dropping steadily instead of going up very rapidly as it should in this age of such increased technological progress. The American industrial machine needs more technologists and scientists. National survival makes it imperative that we have more engineers and scientists.

"The oil industry is pretty well fixed for engineers," he concedes, "and I think we can always attract at least our share of each graduating class. We can pay about as well as anyone else can. But, that's a pretty narrow-minded and selfish attitude. Our American society needs more and more technically trained people."

Students ducking science . . . The Shell vice president is confident that his company has put its finger on two closely related trouble spots. It is already moving on a program designed to attract attention and the thinking of industry toward one of them.

"We're not enticing boys and girls into the study of the sciences," he will tell you flatly. "The attraction to science seems to come in the early teens if it comes at all and we're not doing well in this respect."

He cites statistics to prove his point. Since 1900 the percentage of students studying algebra in high schools has fallen from 56 per cent to 24. Geometry students have dropped from 27 per cent to only 11 per cent. Today, only 4.3 per cent of our high school students study physics. That figure was 19 per cent 55 years ago.

"It's not the fault of our high school students, either. It's our fault. Today's high school student is just as smart as he ever was. The human race isn't changing that fast."

Teachers neglected . . . Spaght places the blame squarely on the public—for its neglect of its teachers.

He points to surveys which reveal that last year American colleges graduated 57 per cent fewer high school science teachers than they did in 1950. Fifty-one per cent fewer mathematics teachers came out of American colleges last year than 5 years ago. The need for high school science teachers is going up at a fast clip and the sup-

What About This Manpower Problem?

HOW bad is the shortage of scientists? What can be done about it?

This is the first of a series of five articles on the subject.

The Journal questioned scores of oil men and educators. We uncovered differing viewpoints, but agreement on this: There is a problem—and a serious one. It has generated much talk but little action. What has been done has been sporadic and individual effort.

This article is the viewpoint of a major oil company executive.

Others in the series will present the ideas of: A director of research; a personnel expert; a superintendent of schools; and a spokesman for professional engineers.

ply is diminishing. The National Educational Association estimates that 7,700 were needed in 1954-55 and this figure will be 10,000 by 1965-66.

In spite of the fact that the supply of qualified teachers each year is below the demand, many who are trained to teach never do—or don't teach for very long. A study of 1953 college graduates shows that only 40 per cent of those qualified to teach science and mathematics were actually teaching a year after graduation.

Because of this teacher shortage, Spaght points out, more than half the high schools in the United States have no classes in physics or chemistry.

"How can we entice our young people into scientific fields if we don't even expose them to the subjects in that early teen-age period when their interest can best be captured?" Spaght asks.

He's got a pretty candid and to-the-point answer to the "whys" involved in the situation, too.

"The teaching profession in this country has been forgotten," Spaght says flatly—even a little belligerently. "Every day we see such newspaper stories as this: 'High school teacher becomes truck driver for brewery in order to support his family.' As we have let our teachers down financially, so have we let the dignity of teaching fall in this country.

"In Europe, it has always been a mark of distinction to be a teacher. A teacher is respected, he's an important man in the community, as he should be. Once that was also true here. But we seem to be losing it."

What Shell is doing . . . Shell is making a frontal attack on this fault of American society and it's doing it through Shell Companies Foundation, Inc.

Shell will underwrite seminars next summer at Stanford and Cornell for 60 high school teachers to be chosen on the basis of merit and demonstrated leadership qualities.

The teachers, 30 of them from each side of the Mississippi, will receive travel allowances, all tuition and fees, living expenses on the two campuses, and $500 in cash to compensate them for lost earnings from any potential summer job.

The seminars will include graduate-level classes in the latest instructive techniques, lectures by outstanding scientists, and visits to modern industrial plants and research laboratories. The idea is to inspire those science and mathematics teachers who, in turn, can best inspire the scientists and science teachers of the future.

"It's very simple," Spaght says. "The plan is to give our teachers dignity through recognition. We're trying to say 'We're on your side and this is a token to show you we are.'

"We want to put more light on this subject and see if we can't start people thinking. Shell can't do it all. This is a very small program. But, we're beating the drum to help high school teachers and the high school curriculum. We hope people notice it and join the parade."

Shell hopes this initial volley in its campaign may help to change the overall high school graduate trend.

"One of our leading universities recently told us that there are two things different about the high school graduate of today, as compared to that of yesterday," Spaght said. "He is far less well-grounded in the basic subjects of mathematics and the physical world about him than he once was. And, the writing of the English language is a lost art to the high school graduate. He can't write a thesis, he can't write a report. He can't express himself."

Too many miss college . . . In spite of the fact that the number of high school graduates and those who go on to college is on the increase, studies reveal an alarming fact. Only about half the top 25 per cent of those best qualified for more education, go on to universities. Today, this is about 80,000 students.

There are two basic reasons why they don't continue their education. They haven't been stimulated by their teachers and parents, or—and this is an equally common reason—they simply can't afford to go to college.

"This is a terrible waste of our potential talent," Spaght believes. "Here is an untended chore for someone. Everyone is talking scholarships, many programs are already under way, and I think that many more are coming. Shell has no program for scholarships for this group now but we are thinking hard on the subject."

How Shell got started . . . This would add a "fifth string" to Shell's bow. The first string came years ago when a group of Shell men began talking among themselves about American education and the training of scientists and engineers. Their discussions revolved around two questions:

What are our obligations toward the educational machinery of the country in which we live?

What can we, as a company, do about them?

The first conclusion or "string to the bow" resolved from what Spaght concedes were somewhat selfish interests. The company set up a fellowship program for graduate work in the physical sciences and engineering. Many other oil companies were doing the same thing, and today, the graduate fellowship program in American universities, both private and public, is pretty well cared for.

"There aren't many colleges that can't provide a fellowship for a bright fellow who is well qualified and wants to do graduate work. The prime need no longer seems to be in this area," Spaght says.

The second string to Shell's bow came a little later in the form of unrestricted grants of money to outstanding departments of universities for pure research. Shell each year now makes about 25 of these grants to private institutions.

Why doesn't Shell do its own pure research? It does do a lot of such research, but most of its research work must be in applied fields rather than fundamental.

"The American university stands today as one of the most eligible instru-

ments in our society for pure or basic research," Spaght says.

The third string added to the bow is the high school teacher seminar program.

The fourth has to do with the company's 36,000 employes in this country and the active urging they get from management to become a vital part of the over-all program.

One way to help . . . "We encourage our people to lecture or help in teaching any way they can and they extend invitations to teachers and students to visit Shell plants and laboratories.

"Our people are encouraged to join or work with the school boards in their own communities, and thereby help to improve the status of the teacher and the teaching.

"Shell management all over the country is instructed to give summer employment to teachers whenever it is available, especially in jobs that will extend their own knowledge and teaching skill.

"Our people are told specifically that they aren't to wean teachers away from their profession," Spaght adds. "We'd like to employ teachers in the summer on the firm understanding that they go back to teaching in the fall."

Spaght believes that industry's top people must be the spokesmen for a widespread program to bolster the country's educational system in every way.

"We in industry can't overhaul the country's educational system," he admits wryly, "but we can make the country so conscious of its shortcomings and its needs that it will be done.

"It's later than we think."

It's a sticky right-of-way on T.G.T. line but . . .

Pipeliners Span Swamp in Jig Time

HOUSTON.—Laying Tennessee Gas Transmission Co.'s 30-in. line along the marshes and rivers of the Texas-Louisiana Gulf Coast was soft work.

So soft—pipeliners waded through ankle-deep mud. Tractors nearly buried themselves.

But men and machines put the pipe into the ground at the rate of 3 miles per day to complete the 370-mile pipeline on time.

Extending from Agua Dulce, Tex., to a point near Kinder, La., the new line is an important outlet for both onshore and offshore gas reserves along the Gulf Coast. The coastal link was put into operation less than 4 months after construction started. The job was completed last week except for cleaning up the right-of-way at a few points.

Besides crossing miles of swamplands, the big-inch line extends under nine major water channels. These include the Guadalupe, Colorado, Brazos, Trinity, Neches, and Sabine rivers in addition to Lavaca Bay, Houston Ship Channel, and Cedar Bayou.

The crossing at Lavaca Bay, about 29,000 ft. in length, is the longest underwater crossing ever made by a T.G.T. main line.

Eight companies shared in the construction job *(The Oil and Gas Journal, August 22, page 93)*. Cross-country jobs, let in four contracts, ranged from 73 to 96 miles in length. Contracts for water crossings were awarded separately.

New district headquarters, each equipped with FM radio, are to be maintained near Rosharon and Willisville, Tex. Other segments of the line will be operated from existing headquarters at Kinder, La., and Victoria and Agua Dulce, Tex.

The 370-mile line has a capacity of 270,000 M.c.f. of gas daily and cost about $35,400,000. On the eastern end, it ties in with a 576-mile, 30-in. line which T.G.T. built in 1954 to connect south Louisiana fields with its main system near Nashville.

SoPac Expanding

176-mile products system to feed Air Force bases

LOS ANGELES. — Southern Pacific Pipe Lines, Inc., is building a 176-mile, 6-in. products system which will supply four Arizona and California air bases with aviation gasoline and jet fuels.

Bases will be fed by laterals from the company's newly completed 418-mile line from Los Angeles to Phoenix. Products will be pumped eastward from the Norwalk Air Force storage terminal in eastern Los Angeles.

The project is to be completed before April 1.

Contractors . . . Contract for the 76-mile section between Davis Monthan Air Base, Tucson, and Magma, Ariz., has been let to Engineers Limited Pipe Line Co., San Francisco.

Hood Construction Co., Los Angeles, will build the 58-mile section between Magma and Williams Air Base at Phoenix and an 18-mile line from Phoenix to Luke Air Base.

Bids are being received on the 14-mile project from Colton to March Field near Riverside, Calif.

J. A. McNeil, Alhambra, has the contract for the military fuel pump station and metering equipment at Colton. Contract for the Phoenix station has not been let. M. M. Sundt Construction Co., Tucson, will install positive-displacement meters at the three Arizona bases and J. H. Pomeroy & Co., Los Angeles, will handle those at Norwalk.

Main lines completed . . . The 424-mile, 8-in. El Paso - Phoenix leg of Southern Pacific's products line is already in operation.

The first shipment was gasoline from Standard Oil Co. of Texas refinery at El Paso. Avgas, diesel fuel, and jet fuel will be pumped later. The 12 and 16-in. Los Angeles to Phoenix line is due to start operating later this month.

Harris Bill Fight Opens

● Early decision in Senate believed likely with odds good for passage; but real threat lies in crippling changes

WASHINGTON.—The Senate finally may come to grips with the Harris bill this week. And this early showdown could be an omen of good for the fight to free natural-gas producers from federal controls.

Majority Leader Lyndon Johnson of Texas says he plans to call up the bill early this week. No one has attempted to estimate how long the approaching fight will last.

Preliminary debate on the measure got under way last week, leading to a belief the Senate may dispose of it speedily.

Observers believe that Johnson counted votes before moving to call up the bill, and feel he has enough to pass it. The one uncertain factor is the attitude of senators on amendments that will be offered.

Each amendment will have some support and therein lies a real danger to the bill. The Harris bill barely passed the House last year. Its backers feel they now must push the measure through the Senate without seriously amending it so the bill can go straight to the President. They fear another battle on amendments in a House-Senate conference would stall the bill permanently.

Drive for votes . . . Opponents of the bill claim they have picked up considerable support.

But Sen. Alexander Wiley of Wisconsin, a vigorous foe of the measure, admitted they didn't have enough votes now to defeat the bill.

Fate of the proposal, Wiley said, may well be decided by the votes of a small group of senators not yet committed to either side.

Over the week end, both sides stepped up their attempts to round up those vital votes.

Who's fighting . . . Both supporters and opponents last week directed appeals to the public to get into the fight.

And senators from the coal-producing states indicated they will try to amend the bill to prevent "wasteful" uses of gas.

The Council of Local Gas Companies distributed a 16-page pamphlet repeating charges previously made that the Harris bill would bar the Federal Power Commission from having anything to do with gas prices. The council called for defeat of the bill "in its present form" because it doesn't protect the consumer.

ALEX M. CLARK
. . . Makes good on threat

The General Gas Committee issued a bulletin of its own, answering the council's charges. It emphasized that the distributor group consists only of some 50 of the more than 1,000 local gas companies "and its leadership represents a segment of these public utility interests that has been conspicuous by its failure to pass on to the consumer the benefits of lower costs made possible by natural gas."

The Joint Committee of Consumers and Small Producers also joined the fray. It issued a statement that the big eastern gas utilities "are trying desperately to deceive the public into believing that fantastically high prices will be forced on gas companies unless a bureaucratic stranglehold is maintained on the producers."

Making good on his threat to "expose" the interests back of the opposition to the bill, Alex M. Clark, chairman of the committee, alleged that three New York utilities have made savings of $200,000,000 in the past few years through use of natural gas "without passing more than a few pennies in savings along to the consumer." And in another 5 years, he declared, they will add at least $350,000,000 "and still there is no real rate reduction in sight."

Figures awry . . . Maston Nixon, chairman of the General Gas Committee, also charged the utility group with making "flagrant basic misstatements."

They claim passage of the bill would result in price hikes that would cost consumers over $750,000,000 a year, Nixon said. On the contrary, he pointed out, the bill contains consumer-protection provisions that insure reasonable market prices in the field.

$5 an hour, million members . . .

. . . O.C.A.W. Sets Sights High

DENVER.—The oil industry got another look last week at the long-range organizing plans and wage goals of the Oil, Chemical and Atomic Workers International Union.

This is what it saw: Goal of a million members in the United States and Canada and doubled wages in 5 years.

O.C.A.W. President O. A. (Jack) Knight dangled this prospect before union members in a "New Year's Call to Action" spread across the front page of the Oil, Chemical and Atomic Union News.

Knight told the union:

. . . **"Your wages** can be doubled in the next 5 years."

. . . **"You can have a paid vacation** of 4 to 6 weeks each year."

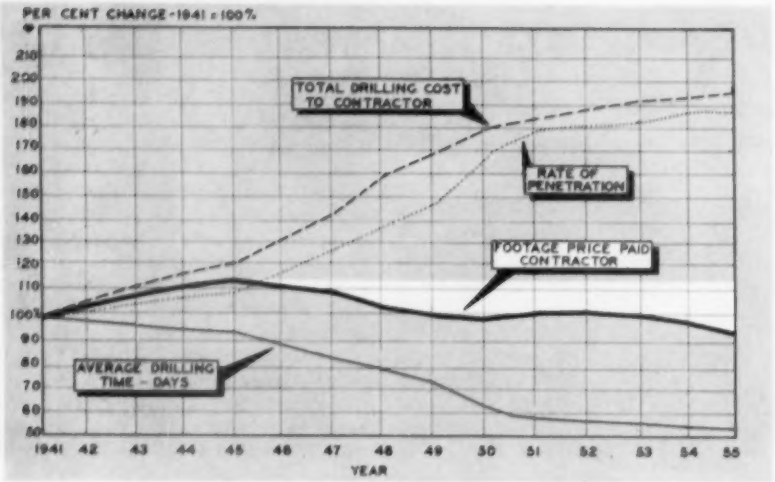
. . . **"You can have medical and hospital** insurance so complete you will never have to write a check to a doctor or hospital."

. . . **"You can have guaranteed in advance** the payment of all costs for 4 years of college for your sons and daughters."

He warned that the improvements will come "only if oil and chemical workers engage in militant, aggressive collective bargaining." He advised the workers to stop thinking "in terms of nickles and dimes and start thinking in terms of dollars."

Knight declared the present size and strength of the union cannot change the basic attitude of companies. He called for a union of a half million oil workers and a half million chemical workers united in a single force. Such strength, he said, is needed because "companies are larger, stronger, more tightly organized than we are."

The O.C.A.W. presently claims a membership of about 220,000 with about 100,000 in oil, largely in refining.



Squeeze Hurts Drillers

- Contractors—caught in bind between rising costs, less income—have just ended probably their worst year
- Speed in making hole has averted ruin before but only answer now appears to be an increase in footage rates

Robert J. Enright

DALLAS.—The drilling contractor is having his troubles. And this time they appear to be serious.

He is in the unenviable position of having to watch himself being crowded between rising costs and lowered income—and without knowing what to do about it.

The contractor has just suffered through what has possibly been his worst year, when the oil and gas industry as a whole had one of its best.

On the surface, things look pretty rosy. The American Association of Oilwell Drilling Contractors estimates the industry drilled an all-time high of 57,500 wells in 1955 *(The Oil and Gas Journal, January 9, page 66)*.

The association reports also there were 2,873 rotary rigs active on the average day last year. This is another all-time record.

The contractors will tell you, however, that it doesn't help to keep a rig working if you can't make any money. Costs to the contractor have spiraled upward steadily since 1941. Last year they were 97 per cent above 1941 and 3 per cent above 1954 (See chart). Footage rates on the other hand, are 4 per cent lower than in 1941 and dropped 3 of this 4 per cent last year, the association says.

New statistics ominous . . . How has the drilling contractor managed to keep going so long with costs going up and his payment down? Simply by employing every technique and new tool developed to drill the wells faster. He has managed to increase his penetration rate and cut his drill time steadily every year since 1941—except last year.

A.A.O.D.C. figures show that penetration rates remained steady in 1955 at 188 per cent of the 1941 rate. Drilling time in days of course reflected the same thing—staying constant at 56 per cent of the 1941 rate.

This is significant. The figures indicate that the contractors have gone as far as they can go in drilling faster with the present equipment. And the contractors verify this.

Fierce competition has reduced the footage rates now to where most contractors can't lay aside enough money for rig depreciation.

As most of them see it, here's what all this means:

Footage rates will have to go up—and soon. If they don't, then they say the industry can expect to see contractors dropping out of the business.

A good many contractors say they'd quit and get out now if they could find a buyer at a reasonable price.

One admitting frankly to such sentiments is Dixie Drilling Co., which operates four heavy-duty dry-land rigs and one heavy-duty barge ring in South Louisiana, plus a mobile platform in the Louisiana tidelands.

Ralph Maddox, Dixie secretary-treasurer, says he can't see how the contract-drilling business could get any worse than it was last year and he can't see any hope for a turn for the better in the next year or two.

"We'd sell if we could find a buyer at a reasonable price, but people wanting into the business are getting scarce." Maddox says his firm was busy last year but that lower footage rates hurt.

"We've gone as far as we can go toward increasing penetration with the present equipment. We can't again, as we have for so many years, count on drilling faster to make up for lower footage rates."

Maddox said a contractor who bought a rig several years ago is just managing to pay interest on the loan. "You couldn't buy a rig now and hope to pay for it."

Dixie isn't finding it quite so tough operating offshore. But Maddox feels the slightly better condition there is only temporary since there are so many new contractors entering the play.

Others find it same . . . Other contractors generally echo Maddox' summation. They're in trouble and can't see any early change in the situation.

Southeastern Drilling Corp. had one of its busiest years in 1955, keeping 85.3 per cent of its rigs at work all the time. The company operates rigs in the Permian basin, Oklahoma, South Louisiana, on the Louisiana tidelands, and in Trinidad. It has four barge rigs, five heavy-duty dry-land rigs, a platform at work, and another building.

Bill Armentrout, secretary, says continuity of work is better but that this is a mixed blessing if any blessing at all. With costs still going up and footage rates down "all we're doing is wearing out our rigs—we can't even make depreciation."

Southeastern is finding it exceptionally rugged in the Permian basin. This is in spite of the fact that all its rigs in the area are big fellows (rated depth capacity of 15,000 to 18,000 ft.), and competition is usually keener for shallower projects.

The company agrees with Dixie that things are somewhat better offshore. Armentrout credits this partly to the backlog of offshore locations. The big reason though, he thinks, is because the operator has to depend more on the contractor's integrity due to the extreme costs and risks.

John J. Fleet, head of Fleet Drilling Co., says his is another firm which can't set aside enough to provide for rig depreciation and replacement. Fleet operates 22 rigs ranging from light to heavy in North Texas and Oklahoma. He feels that a good many contractors are managing to stay in business because they also have some oil produc-

tion. Otherwise, he thinks, there'd be a great many more casualties.

Conditions are much the same in Kansas, according to E. Dale Mount, drilling superintendent for Harry Bass Drilling Co. and new president of the contractors association.

Bass operates six rigs, two light and four heavy, in Texas and Kansas. The latter, Mount says, has proved an even tougher competitive drilling area than the Permian basin.

The Bass firm was the only contractor interviewed by the Journal which said it had made a profit last year. Mount said the company had managed to meet overhead and "keep its rigs up okay" and still emerge with a slight profit.

Mount terms the profit microscopic, however, and says "I'd hate to think we'd have to work so hard every year to make only that much." He credits what little profit there was to the company's having less overhead than most.

Little better in Canada . . . The grass looked greener in Canada to Trinity Drilling Co.

Trinity sold seven rigs it operated in the United States to Penrod Drilling Co. in June 1954. It has since operated only in Canada with five medium-range rotaries.

Footage rates are considerably better there but the operator ends up in about the same condition when higher costs are deducted, according to Trinity's Tom Berryhill.

Locations sometimes are almost inaccessible. Transportation and supply expenses are terrific. The company recently completed a 475-mile move in British Columbia which required 75 men and 54 tractors and half tracks. This was in —50° weather.

All supplies must be brought in by helicopter. British Columbia, where the company is concentrating primarily, has a 5 per cent sales tax on nearly everything purchased there.

How it happened . . . How did the contractor manage to get in such sorry shape?

A big reason is the nature of the business. It is one of the most competitive in the world. It has been one of fluctuations, with the contractors having first good times then bad.

The most recent and most disastrous skid was set off, the majority think, by the collapse ofthe Spraberry drilling boom in West Texas. Contracts were so plentiful in the area 4 to 5 years ago that a great many inexperienced newcomers joined the play.

Profits looked lush to some of the newcomers. They had considerable cash left over from a project after deducting drilling costs. They neglected to figure in depreciation. This came home to such operators with a thud later, when the boom fizzled out and contracts became more scarce.

With payments on rigs to make, they started to cut footage bids in order to get work. This touched off a price war which swept experienced contractors along with it.

An official with Rowan Drilling Co., Fort Worth, said his company tried for some time to keep its bids high enough to provide for maintenance and replacement . . . and couldn't get contracts. Rowan finally had to fall in with the rest.

Contractors feel, however, that some of the blame must lie with the oil producer. Why? Because of a seeming general change in operator philosophy. The contractors say operators now are encouraging competitive bidding for field development drilling at each location, whereas an able contractor in the past generally was assured of steady work once in a field.

Armentrout goes along with this. Just last month, he said, a major-company representative approached him thusly: "Look. We're paying you higher rates than this other fellow with the same equipment is asking. How about it?"

This, Armentrout and other contractors think, not only hurts the contractor but is eventually going to snap back at the operator. Contractors now do more than 90 per cent of the drilling in this country. The percentage has steadily increased primarily because the contractor can do it cheaper.

Operators will suffer too if contractors start falling out of business he says.

Mount thinks that oil operators are contributing to contractors' woes with such tactics because the operators simply don't believe the contractor is as bad off as he says.

The contractor, Mount says, has to take the blame for this. "I have never seen a time when a contractor would admit to making money when talking to a producer," he said.

"It's a lot like the fable where the little boy yelled 'wolf.' Now that the contractor really is in trouble, the operator doesn't believe him."

What's ahead . . . Few contractors expect to do much better than they are now for the next year at least.

Some think the present situation will gradually ease if 1955's trend of busier rigs continues for several years. Few rigs are being purchased now and many are being worn out. This should mean more holes for fewer rigs eventually.

Some also hope for new techniques or equipment which will enable them to drill even faster.

The contractors agree that something will have to break soon, though.

Cosden Unifining Unit Goes on Stream

A 2,100-bbl. Unifining unit has been placed on stream at Cosden Petroleum Corp.'s Big Spring refinery.

The unit, built by Cosden personnel, will process a 300° to 400° F. naphtha cut—about 30 per cent of the charge to an existing Platformer.

Hydrogen and naphtha will pass through a catalyst at 650° F. and 500 psig. After condensing, the effluent from the reactor will go to an accumulator where the hydrogen will be flashed.

Condensate from the accumulator will be charged to a stripper to remove any remaining light gases. Hydrogen for the hydrogenation process will come from the Platformer.

The Unifining unit is expected to trim corrosion costs substantially by removing sulfur, nitrogen, and contaminating metals which are presently shortening catalyst life in the Platformer.

Are octane ratings too high? What does it cost to add a number now? Will a crude-oil price increase hurt refiners? A Journal editor presents the combined answers of many interviews with Gulf Coast processors. They tell . . .

LARRY RESEN

. . . What Gulf Refiners Are Thinking

Larry Resen

Q. What do you estimate it costs to add an octane number in the 95-plus octane range?

A. Contracts have been made which call for 0.2 cent per gallon of premium in the 95-97 range, and 0.25-0.3 cent per gallon premium for 97 octane and above. But when you get to 97, it generally costs about half a cent per gallon to add an octane. That includes plant investment and lead cost of about 0.15 cent per gallon.

In January 1955 the cost of a unit research octane number was quoted at 0.34 cent per gallon for 95 octane.

When you resort to aromatics to get over the hump to higher octanes (98 and above), costs would be 0.65 cent per gallon. This route would be used after reforming and lead addition had been exhausted. Blending of alkylate to get higher octanes would cost about the same.

The cost will vary with the individual refiner's situation. But there is no doubt that the cost curve slopes sharply upward when you reach 95 octane.

Q. What route will the industry take to get 100-octane—alkylation, isomerization, reforming, Rexforming, Iso-Plus, aromatics blending?

A. Catalytic reforming will be used to upgrade as much naphtha as possible. More units will be built until capacity reaches the limit. And that's not too far off.

Beyond this, alkylate and aromatics blending appear to be convenient, but expensive, means of raising octanes. Many alky plants have been built or revamped. And while some of us don't like to admit it, more and more alkylate is finding its way into motor fuel.

Aromatics are available from reforming and can be conveniently blended. But again, the cost will be high.

The next processes such as Rexforming and Iso-Plus are likely candidates, too, although they're not the whole answer by any means. Farther down the road, we might be synthesizing triptane and using isomerization.

Q. How long will it be before 100-octane motor fuel is on the market?

A. The breakthrough may come in 1957. But it may be delayed until the following year. We're holding our breaths until the first refiner comes out with 100 octane. Then watch out.

That's pouring octane down the drain. But competition will force us into it.

Q. We now have 98-octane on the market. What do you think a more sensible premium gasoline octane number should be?

A. Generally, octanes are about one number too high now. And look at the spread. The difference between motor and research octane confuses the issue. But we've gone overboard on octanes, what with the emphasis of advertising on the higher octanes and Detroit's insistence on turning out over-powered engines.

And look at the waste of money and material in the gap between octane numbers between the East Coast and the Gulf Coast. There's a spread of about four numbers, from 87-88 on the Gulf Coast to 91-92 on the East Coast. There isn't that much difference in car requirements in the two regions.

Unfortunately, the only direction we can see on octanes now is up.

Q. Do you think a crude price increase of perhaps 25 cents per barrel can be absorbed without raising gasoline prices? Can the market stand a product-price increase?

A. We're in no position to absorb an increase. A small portion of one, perhaps, but most would have to be passed on to the consumer. A likely advance would be half a cent a gallon.

Yes, there's no reason why the market shouldn't stand it. Tires and steel and practically everything else go up and the consumer foots the bill. Generally, we failed to get back the raise in crude prices the last time, and certainly we couldn't do that again.

Q. Where do you feel the refining industry can turn to improve its profit picture? Are petrochemicals, new processes, or lower maintenance costs the answer?

A. Petrochemicals still offer the best hope. The early birds have done well in this area. And the opportunities appear unlimited.

Of course we're always working to reduce mechanical and maintenance costs. We have to. Look at the high percentage of our work force that is devoted to this job. We're working particularly to improve scheduling of our crafts. We're leaning on experience to avoid costly unscheduled shutdowns. And we expect improved metals in severe services to help reduce maintenance. Larger units also promise to improve this picture.

New processes, too, will have their effect. The Houdresid process for charging residual to cat crackers is one of the first that comes to mind.

Q. Has the steel-price hike caused a reevaluation of your construction plans down the line?

A. No. Most plants have hit a plateau in construction. The boom has slowed. So the steel price hasn't affected our construction plans materially yet.

Q. How far and how fast do you think automation will progress? Do you think operating manpower is now close to a desired minimum?

A. There's a lot of noise about automation currently. But it's not new. Our plans have always been automated to a high degree out of necessity.

Use of the highly automated units will generally be limited to new plants which can easily plan for such systems. The investment in present equipment almost rules out much replacement with newly developed instruments.

Some of these are so complex you have to assign special personnel just to keep up with new developments. Or you have to add instrument engineers to your staff to take care of the equipment. Automation will be slowed somewhat by the fact it's hard to work old and new units in the same plant into an automatic system.

We'll continue to improve our plants, as we've been doing up to now, to keep raising efficiency.

As far as operating manpower is concerned, we're about at a practical minimum there. You always want someone around. And we don't think the increased use of instruments will necessarily displace our existing manpower.

Echoes of fight linger, but . . .

. . . Minot Is Cooking With Gas

MINOT, N. D.—Natural gas finally has reached Minot over a new pipeline, allowing city officials to stage their long-delayed torchlight party.

A pre-Christmas ceremony was cancelled when legal snarls halted start of service over the new line of Montana-Dakota Utilities Co. *(The Oil and Gas Journal, December 5, page 88).* A district court order later assured start of service *(The Oil and Gas Journal, January 2, page 55).*

Mayor Maurice Harrington lighted the gas-fired torch at the civic party to commemorate arrival of the new fuel. But echoes of the bitter controversy between Montana-Dakota Utilities and the state Public Service Commission crept into remarks of visiting dignitaries.

Cecil W. Smith of Minneapolis, president of Montana-Dakota Utilities, declared his firm would extend its transmission lines to eastern North Dakota from Minot as soon as it feels gas reserves have been developed sufficiently.

The Public Service Commission had demanded extension of service into eastern and southeastern North Dakota plus a cheaper purchase price for the gas before approving the new line. A district court order later permitted the utility to sidestep the conditions.

The commission also was defended at the torchlight ceremony. Commissioner Anson J. Anderson declared the commission majority doubted "the feasibility of a transmission and distribution system that only expects 3¼ per cent net return in the third year of operation."

He added he feared the utility would petition the commission in a year for a substantial rate increase to allow it a 6 per cent return on its investment. He said, "If this should happen, Minot residents would protest by the carload."

HAPPY ARRIVAL of natural gas to Minot, N. D., is commemorated by torchlighting. Mayor Maurice Harrington, center, holds the lighter. Assisting are Robert Cummings, left, and Luther M. Wells, Montana-Dakota Utilities Co. officials.

C. E. Boone, Tulsa, a vice president of Amerada Petroleum Corp., pointed out the flare of natural gas at the Signal Oil & Gas plant near Tioga has stopped with operation of the new line. He said Amerada "hopes it will never be lit again."

The new line from Tioga to Minot uses the gas formerly flared. Gas from the Tioga and Beaver Lodge fields is processed at the Signal plant. Amerada owns the processed dry gas. It could use only about 3 to 4 million cubic feet daily in its field operations and had flared the rest, about 20 million cubic feet daily.

Refinery to Expand

Venezuelan crude may be imported to make asphalt

CORPUS CHRISTI, Tex. — Corpus Christi Refining Co. has announced plans to process up to 3,500 bbl. daily of heavy crude, probably of Venezuelan origin.

A $560,000 modernization program at the company's 7,000-bbl. refinery here will include refurbishing a now-idle vacuum unit for production of road asphalt. The overhauled unit will process a maximum of 3,500 bbl. of 10° to 12°-gravity crude per day, boosting the plant total capacity to more than 10,000 bbl. daily.

In addition to facilities for manufacturing 200,000 tons of asphalt annually, a visbreaking unit, expanded storage, and tank docks are planned. The refinery will be shut down for expansion and general overhaul until about June 1.

Cecil V. Hagen, Houston, and associates bought control of the refinery last year. About $640,000 has been spent since then in expanding and modernizing it.

Company officials said two 80,000-bbl. tanks will be built for crude storage, and two 55,000-bbl. tanks will be converted to product storage. One of the new tanks will be equipped with heaters to handle heavy Venezuelan crude.

Asphalt-Plant Contract Let

HOUSTON.—Pona Engineers, Inc., Houston, has been awarded contract for engineering work and supervision of construction at a 2,500-bbl.-per-day asphalt refinery to be built at Pasadena, Tex.

The plant, to be owned and operated by the newly organized Texas Asphalt & Refining Co., is scheduled for partial operation by July 1. Full-scale operation is set to begin in October.

Engineering work on the plant is about 50 per cent complete. Pona will accept construction bids early in February and foundation work is scheduled to start late in the month.

Texas Asphalt & Refining is headed by A. R. Matthews of Fort Worth *(The Oil and Gas Journal, December 5, page 86).*

Houston Sale Pending

If tax men and stockholders approve, it will become one of the biggest cash sales of oil properties in many years

HOUSTON.—Sale of Houston Oil Co. of Texas, probably will involve one of the largest cash payments in years for oil and gas properties.

Under a liquidation plan approved by company directors, stockholders would receive an estimated $224,654,265. The plan calls for sale of its oil and gas properties and its subsidiary Houston Pipe Line Co. to Atlantic Refining Co. *(The Oil and Gas Journal, January 9, page 57).*

Harold Decker, Houston Oil president, said the plan is expected to be submitted to stockholders at a special meeting, probably within 60 days.

The plan calls for an intermediate company, Nalam Corp., to buy Houston's oil and gas properties. Atlantic would take over their operation and eventually acquire them through oil-production payments. The plan is similar to that used by Sinclair Oil & Gas Co. in buying American Republics Corp.

Atlantic officials identified Nalam as "an existing New York company" but declined to identify its owners or sources of finance.

Decker explained that the sale to Atlantic is contingent on liquidation of Houston Oil's timber and paper interests. The company is negotiating for sale of its wholly owned subsidiary, Southwestern Settlement & Development Corp., and its half interest in East Texas Pulp & Paper Co. to Time, Inc. The publishing firm already owns the other half interest in the pulp and paper company. Time also holds about 10 per cent of Houston Oil's outstanding stock.

The amount Atlantic offered for the oil and gas properties was not disclosed. Decker said, however, that the total sale price is expected to amount to about $165 a share for the 1,361,451 shares of stock outstanding.

Rival bidders . . . Announcement of the pending sale followed a 2-day meeting of Houston Oil directors with President Henderson Supplee, Jr., and other officials of Atlantic Refining.

Outright sale or merger of Houston Oil had been expected for several weeks. More than half a dozen companies had been negotiating for the oil and gas interests in recent months.

Sinclair Oil & Gas Co., which has half interest in most of Houston Oil's producing properties, was among the prospective purchasers. Also listed among recent negotiators were Shell Oil Co., Gulf Oil Corp., Humble Oil & Refining Co., Sohio Petroleum Co., Union Oil & Gas Corp. of Louisiana, and the Belgian company, Cie Financiere Belge des Petroles, S. A. (Petrofina).

What made Houston Oil such a lucrative firm is its relatively large oil and gas reserves. The company produces about 17,000 bbl. of crude and condensate daily. Sales of natural gas by the parent company average about 100,000,000 cu. ft. per day, and the pipeline company sells an additional 350,000,000 cu. ft. daily.

As of October, Houston Oil had an interest in leases covering 696,638 acres, including 130,244 productive acres. In addition, it owned half interest in mineral fee with Sinclair in 868,783 acres.

The company's production comes from about 750 oil and 220 gas wells in which the company owns an interest. Most of its production is in the Gulf Coast area of Texas and Louisiana, although the firm also has holdings in West Texas, New Mexico, and Wyoming.

Tax situation . . . Decker said final action on the sale will depend on a favorable tax ruling by the Commissioner of Internal Revenue.

The plan is to take advantage of new provisions in capital-gains taxes which make possible large tax savings to stockholders. Decker said details of the proposed transaction must be worked out carefully by attorneys before they can be submitted for stockholders action.

Unless the company's entire assets can be disposed of, the deal with Atlantic Refining presumably would not go through.

Atlantic's position . . . The purchase would help balance Atlantic's crude and products output in the Gulf Coast area.

The company's refinery near Port Arthur has a daily capacity of 61,000 bbl. Crude production in its Gulf Coast region now averages about 22,000 to 23,000 bbl. daily. With the Houston Oil properties, this figure would rise to nearly 40,000 bbl. daily.

A further increase in this area is anticipated from the company's offshore leases. Atlantic has 25 per cent interest in the C.A.T.C. group, which has made several important discoveries offshore. So far, though, Atlantic's share of tidelands production is only 400 to 500 bbl. daily.

Atlantic's total U. S. production is about 92,000 bbl. daily under present allowables. It has another 13,000 bbl. in Venezuela. Total refinery capacity is about 204,000 bbl. daily.

A spokesman for Atlantic indicated the company will take over all Houston Oil operations. This would mean that joint leases now operated by Sinclair would continue under Sinclair operation. Sinclair's interest in these leases was acquired last year in the purchase of American Republics Corp. *(The Oil and Gas Journal, March 28, 1955, page 83).* Sinclair paid only $33,000,000 in cash for American Republics and agreed to pay an additional

HENDERSON SUPPLEE, JR.

. . . Buying through an intermediate

HAROLD DECKER

. . . Must sell paper, timber interests

$75,000,000 from future production.

Since Sinclair already had a joint interest with Houston Oil in many leases, that company was considered the likely purchaser when it became known that negotiations were under way. Sinclair also owns the Petroleum Building here, which is headquarters for Houston Oil Co.

Pipeline properties included in the proposed sale to Atlantic include a 715-mile gas system and gathering lines in the Texas Gulf Coast area.

Houston Oil background . . . Houston Oil Co. of Texas was founded July 5, 1901. Decker has been president since 1950.

As of December 31, 1954, the company and its subsidiaries listed total assets of $87,581,431. This total included nearly $5,000,000 in timber property and nearly $4,500,000 in pulp, paper, and mining interests.

Consolidated net income dropped slightly in 1954 but has risen sharply in recent months. The total for 1954 was $6,487,785 as compared with $6,709,844 the preceding year. For the first 9 months of 1955, however, net income rose to $5,109,119. This compares with $4,307,951 for the comparable period of the preceding year.

102-Mile Products Line Let

ABILENE, Tex.—Cosden Petroleum Corp., Big Spring, Tex., has awarded contract for construction of its 102-mile products pipeline to run from Big Spring to Abilene.

C. C. Holder Co., Snyder, Tex., who won the contract, plans to begin work within 2 weeks. The 6-in. line will be built from the Cosden refinery to the firm's products terminal here.

A 4-in. feeder line will be laid from the main line west of Abilene to a nearby Air Force Base. The feeder line will supply JP-4 (jet fuel) and gasoline to the base.

Tekoil Buys Kio Oil

DALLAS.—Tekoil Corp. will take over operation of 131 producing oil wells purchased from Kio Oil & Development Co., effective January 23.

Stockholders have approved the deal giving Tekoil the production in Oklahoma, Texas, Indiana, and Illinois, and 3,000 acres in undeveloped leases. Purchase price was more than $1,000,000. Tekoil's reserves will be more than doubled by the acquisition.

The company, headed by W. H. Davison, former president of Core Laboratories, Inc., emphasizes secondary recovery in its operations. Tekoil expects to increase output on Kio property in East Centerville field in Illinois by water flooding.

WATCHING WASHINGTON

Bertram F. Linz

Gas Cases Pile Up

Federal regulation of independent natural-gas producers is turning out to be just as big a job as everybody thought it would be.

In the first 18 months following the Supreme Court decision in the Phillips case the Federal Power Commission received over 13,500 rate filings from producers.

Some 7,000 filings were for rates in effect June 7, 1954. But just short of 5,000 involved rate-schedule changes and nearly 1,100 were for new services.

The FPC's big job is concerned with rate changes. Over 3,200 rate increases were filed, amounting to $48,546,500 a year, and 1,185 rate decreases totaling $1,240,000 annually.

The FPC allowed 1,978 tax increases amounting to $6,904,444, and 1,047 other increases amounting to $26,605,000. But it suspended 221 applications for increases totaling $15,798,000. Up to last December 1 only 32 of these cases had been acted on, 15 of them being withdrawn.

Refinery Safety Improves

A refinery isn't the safest place in the world to work. But it's getting safer every year.

The Labor Department recently made a study of industrial accidents. It found that injury-frequency rates in refineries were about half those for industry as a whole.

There was an average of 5.9 injuries per million employe-hours worked in refineries in 1954. The rate for all industry was 11.9 per million hours. More to the point, the 5.9 rate was an improvement over 1953, when there were 6.6 injuries per million hours.

Death or permanent total disability occurred in only 0.5 per cent of the cases. Permanent partial disability resulted in 6.2 per cent. The remaining 93.3 per cent of workers injured were temporarily disabled, but later returned to work.

Tanker Picture Cloudy

Congress may consider government construction of more tankers unless the Military Sea Transportation Services comes up soon with some charter contracts to support the building of privately owned vessels.

A 20-tanker program was laid down in 1954. It called for the building of five vessels by the Government and 15 by private enterprise for charter to the MSTS. Four of the government tankers are now building. The fifth couldn't be started because Congress didn't provide enough money.

But so far, no contracts have been fixed for the private tankers. Last year, the MSTS thought it had a contract set for eight vessels. The contractor couldn't meet the financial and construction conditions, and the contract was dropped.

At the year end, the MSTS reported to Congress that it hadn't made any headway and was making a new start. New proposals were received this month, but how many and how good they may be hasn't been divulged.

Chairman Vinson of the House armed services committee reportedly is getting impatient. He wants to see many new tankers built. It was Vinson who got the four government tankers started.

Navy officials will appear before Vinson's committee soon for their annual discussion of their programs. Vinson is expected to take advantage of the opportunity to go deeply into the tanker situation.

Offshore Ruling Affirmed

Oil and gas reserves of the outer Continental Shelf are not under "public lands" and are not subject to lease under the Mineral Leasing Act.

That position has been taken twice by federal courts. A U. S. Court of Appeals this month affirmed a decision of a District Court in a case involving an application for "public land" leases off Huntington Beach, Calif.

The issue has been in and out of the Interior Department and the courts for many years.

There's a possibility that the matter may go to the U. S. Supreme Court. But in none of its tidelands decisions did the court suggest that they were public lands. Nor were they so classified by Congress in the Submerged Lands Act. It provided that the lands should be leased under regulations issued by the Secretary of the Interior.

Richfield May Sell Conservation Law

● Company spends plenty of time and money in drive to educate California public on the need to prevent waste

D. H. Stormont

LOS ANGELES.—Chances for California joining the ranks of states with oil conservation laws probably are brighter than at any time in the past.

The initiative measure proposed by Richfield Oil Corp. earlier this month primarily is aimed at enabling unitized operations in pools where a majority of operators desire them. It contains provisions for regulating well spacing in pools discovered after the act becomes effective, and for limiting production to rates which result in maximum economic recovery of oil.

But it specifically prohibits market demand as a basis for prorating production. The three-man commission can limit production of oil and gas from any pool or well only to the extent that waste exists or is threatened.

Because market-demand proration is excluded—even though chances are there'll never again be need for proration on the West Coast—the initiative measure is expected to receive a majority vote in the November 6 general election. Its inclusion in the Atkinson Act in 1939 was the chief reason for the bill's defeat in referendum balloting.

Another favorable factor—possibly of even greater importance—is the public education program Richfield individually has been carrying on for the past 2 years.

Instead of entering the campaign on the defensive, as is the case in a referendum, the ground work laid by the company will enable the industry to carry out an offensive battle during coming months.

Some idea of the extensive, and expensive, preparations Richfield took to sell the need for an oil conservation law to the voting public can be gained from the following. A special staff of 100 to 150 people, including 30 petroleum engineers, was set up. Most of those who were to do the talking were given special classes in public speaking.

During the past 2 years these employes gave more than 150 demonstrations a month to civic groups, service clubs, and conservation groups. Emphasis was given to getting the story to women's clubs. To assure that civic leaders were informed, Richfield paid the tab for more than 20,000 meals.

CHARLES S. JONES
... Champion of conservation

Results of this program is that more than 600,000 Californians have heard the need for an oil conservation law. It's a popular expression that wherever eight people are gathered, at least one has attended a conservation demonstration. In addition, all of the company's 4,000 regular employes have been spreading the word in their daily dealings with the public.

Jones' reasoning . . . From here on, Richfield's president Charles S. Jones declared in an interview with The Oil and Gas Journal, it is expected that almost all of the industry will give the measure both moral and financial support.

Little opposition will come from within the industry. And "because the law will benefit everyone and hurt no one," he sees no reason why serious opposition should come from outside the industry. He likewise anticipates little trouble in obtaining the approximately 325,000 signatures required to place the measure on the November ballot.

Two big West Coast producers, Shell Oil Co. and General Petroleum Corp., have publicly announced they will support the conservation measure. Several metropolitan newspapers have told Jones they will support the campaign.

Jones, who with R. W. Ragland, Richfield vice president, solely sponsored the initiative petition, freely admits the company's direct interest in conservation: "We would like to obtain the greatest ultimate recovery possible from our oil properties, something not possible under our existing laws."

But his interests go deeper than this: "We in the industry must realize that as stewards of their natural resources, we have a tremendous responsibility to the citizens of the state. The responsibility of stewardship is not one to be taken lightly."

As to why he had such firm beliefs in the need for conservation, he declared it stems from his early experiences at the Elwood field. There in 1928, as an executive of Rio Grande Oil Co., he watched "a perfect example of the failure of the law of capture."

"The Elwood field has been one of the finest ever found in California. The inefficient production practices followed there resulted in some 100,000,000 bbl. of oil being lost."

Richfield's record . . . Since the company was reorganized in 1936, at which time the old Richfield Oil Corp. of California was merged with Rio Grande and Pan American Petroleum Co., Jones has been its only president.

At North Coles Levee the company in 1942 gave California its first full-scale pressure-maintenance program. This project offers a brilliant example of the benefits of secondary recovery, Jones declares, benefits possible only under an enforceable conservation law.

Discovered in 1938, the field had only one landowner and Richfield controlled the entire structure. Before pressure maintenance was started 4 years later, the field had produced 7,000,000 bbl. of oil during which a 15 per cent decline in reservoir pressure was experienced. Since then an additional 61,000,000 bbl. of crude have been produced with virtually no loss in pressure.

"Before the gas-injection program was started, Richfield engineers estimated that its primary production would be about 68,000,000 bbl. We are confident we will ultimately produce in the North Coles Levee field at least 100,000,000 bbl. more of oil through pressure maintenance, almost three times the original estimate."

The company's next experience in secondary recovery was quite a dif-

RICHFIELD ENGINEERS AND GEOLOGISTS have been beating the drums for conservation the past 2 years before various civic groups. They have given more than 150 demonstrations a month during the campaign, and the company has paid for more than 20,000 meals. G. Ray Arnett, geologist, above, is shown giving a demonstration.

ferent story. At South Coles Levee, where Richfield held only a 25 per cent interest, several operators were involved. All efforts to unitize by voluntary agreement were futile until World War II came along.

The Petroleum Administration for War, which as a war measure had control of the oil industry, shut down all wells in the field's principal zone because of waste of reservoir energy. Faced with a shutdown, a unit agreement was quickly formed and a gas-injection program started. Ultimate production will be more than doubled as a result.

According to available production figures for last November, Richfield's daily output was approximately 74,000 bbl. Of this amount, about 52,000 bbl. was from fields under unit operation, including North Coles Levee. In all of California, only 12 of the approximate 600 pools are completely unitized and under pressure maintenance.

What is true conservation . . . Richfield's president was highly critical of the Ward bill passed by the California Legislature last April. In wiring Gov. Goodwin Knight, recommending that he veto the act (Senate Bill 1558), he stated:

"Richfield is a strong advocate of true conservation of oil and gas. By conservation we do not mean proration or restriction of crude-oil production to market demand.

"The kind of conservation we are advocating . . . is limited to the prevention of physical waste. To us, conservation means the use of the most efficient engineering methods to the end that the greatest ultimate economic recovery will be obtained from each of the oil fields of California—and nothing else.

"In terms of that kind of conservation, Senate Bill 1558 is meaningless. Moreover, it is deceptive. If it becomes law, opponents of real conservation will attempt to make the people of the state believe that California has an adequate conservation law."

Proposed law . . . The conservation law recommended by Richfield will give a three-man commission power to prevent waste in any oil or gas pool. It may make any order necessary to prevent waste. But it cannot consider market demand *(The Oil and Gas Journal, January 9, page 65).*

In its provisions for "majority rule" unitization, the commission is prohibited from initiating unit plans. Only where 75 per cent of the operating and royalty interests request unitization may it order the minority to enter the agreement.

The commission is given power to set well spacing in pools discovered after the act becomes effective. According to the proposed measure, "size and shape of spacing units shall be designed to accomplish the efficient development of the pool as a whole, and the size shall not be smaller than the maximum area that can be efficiently drained by one well."

Further, when found necessary to prevent waste and protect correlative rights, "the commission shall have authority to divide any pool into sections and to establish spacing units for each section, which units may differ in size or shape from those established in any other section of the pool."

Where there are two or more ownerships in a drilling unit, pooling may be required. Where an owner refuses to participate in a drilling unit, the commission can order that his share of development and operating costs be withheld from the unit well's revenue. If, however, operators in a pool agree to, and abide by, pool rules designed to prevent waste, the commission cannot set well spacing.

Two other requirements designed to protect minority interests which the commission must consider are:

. . . Unitization must be reasonably necessary in order to carry out pressure-maintenance operations.

. . . Volume of additional oil to be recovered by these operations will exceed extra costs incident to the project.

Costs of administering the act and expenses of the commission will be borne by the petroleum industry. All producers and persons owning royalty or other interests in California producing wells will be billed. The operator will pay the assessment and then deduct from his payments to royalty owners and others having an interest in the production.

Initial assessment will be 0.2 cent per barrel of oil produced and 10,000 cu. ft. of gas marketed annually. Thereafter in July of each year the commission will determine the rate necessary to pay expenses. Based on 1955 production the initial rate would provide the commission with approximately $815,000, of which about $720,000 would be from crude production.

The initial commission would be composed of the supervisor and deputy supervisor of the oil and gas division, and one appointed member, serving 4, 3, and 2-year terms respectively. In future governor-appointed bodies, at least one would be a petroleum engineer or production man with 10 years field experience. Annual salary of each will be $18,000.

The state must take two steps before signatures are sought. The attorney general must approve the title of the measure, then it must be filed by the secretary of state. Initially, 90 days is allowed for getting the needed 325,000 signatures. Another 40 days will be granted if extra signatures are needed. The petitions then must be filed at least 130 days before the November election.

Phantom Line Revived

● **Texans, pressed for oil market, reorganize West Coast Pipeline Co. and offer share of project to Californians**

DALLAS.—West Coast Pipeline Co., like the proverbial cat, won't stay dead. The firm has been reorganized to take another stab at building a crude line from Texas to California.

A group of 40 independent Texas oil producers has taken over control of the company formerly headed by L. M. Glasco, Dallas. Glasco will retain a minority stock interest. He has been succeeded as president by John B. Mills, Texas and Arizona oil man and capitalist.

JOHN B. MILLS

West Coast refiners and operators have been invited to participate in ownership of the line. Mills says an advisory committee of independent oil producers also has been set up to carry to Washington the fight for recognition of the line's necessity to national defense.

In the past, opposition from West Coast refiners and refusal of government oil experts to support the 11-year-old proposal have stymied the project *(The Oil and Gas Journal, July 18, 1955, page 68)*.

Mills reports that new plans call for increasing size of the 1,030-mile line from 24 to 30 in. This is more in keeping with West Coast crude demand and continued diminishing supplies available to California refineries, he says.

Mills declares he plans to testify before a House armed services subcommittee later this month on the defense necessity of the pipeline. He admits California refiners still are opposing the plan but adds:

"They are disregarding not only the better gasoline which could be made by using West Texas crude oil, but the fact that their entire oil industry could be knocked out by a single bomb. Their crude supply comes from an area only 7 miles wide. Under war conditions, foreign supplies would be cut off and West Texas and New Mexico would be their only source of crude oil."

Besides the defense possibilities, Mills sees the line as insurance against rapid depletion of California oil fields and as a market for 450,000 bbl. daily of West Texas crude, "over a million barrels a day of which is now shut in for want of a market."

New offer . . . New owners of the phantom line, however, aren't putting all their financing eggs in one basket by relying on government aid alone.

In a move to obtain funds elsewhere and at the same time end opposition on the West Coast, Mills recently offered part ownership in the line to 36 coastal operators.

The offer was made in letters from Mills to seven major operators in California and 29 smaller companies. The large firms were Standard Oil Co. of California, Shell Oil Co., The Texas Co., Union Oil Co. of Califonia, Tide Water Associated Oil Co., Inc., General Petroleum Corp., and Richfield Oil Corp.

Mills said the companies were asked to reply by January 15.

The offer would make stock in West Coast Pipeline available to the West Coast operators if they jointly agreed:

. . . To transport 30,000 bbl. daily of their own Permian basin crude oil through the line, or

. . . To guarantee any revenue loss should the company ship less than 75,000 bbl. daily, the figure set as the break-even point.

Clever move . . . West Coast should stand to gain either way.

If it is accepted, the firm is in. If not, then it has gained a propaganda advantage in its fight for Government financing.

Mills argued last week that the 30,000 bbl. which the West Coast firms are being asked to ship through the line amount to only a quarter of current daily imports of foreign oil into the area and to only 3 per cent of current California production.

The pipeline originally was proposed in the war year 1944. The Government, however, consistently has shied from subsidizing the line by guaranteeing to make up any deficits if deliveries fell below the 75,000 bbl. daily break-even point. Original costs were estimated at $106 million.

The pipeline's new advisory committee which will mastermind the fight for the project include: Jack Woodward, C. G. Johnson, Ray E. Hubbard, Summerfield Roberts, Neely G. Landrum, J. A. Humphrey, and Burt E. Hull, all of Dallas; Read Adm. W. W. Studdert, (retired), and H. E. Chiles, Jr., Midland; Sol Brachman and John W. Naylor, Fort Worth.

Refuge Leasing Fight Spreads

WASHINGTON.—Oil and gas leasing of wildlife is showing signs of becoming more than merely a question of conservation. It bids fair to develop into a full-fledged fight over Interior Secretary McKay's handling of all federal lands.

Last month's announcement that leasing would be resumed after having been held up since 1953 brought immediate charges of a "give-away" against the Interior Department.

But McKay's supporters were quick to claim that the new regulations will protect the refuges. They charged that if any "crime" against conservation has been committed it was in leases made before McKay took office and threw out the old regulations as inadequate.

The fight on McKay is led by Sens. Hubert H. Humphrey of Minnesota and Richard L. Neuberger of the secretary's own state of Oregon. They indicated a desire for a congressional investigation. Humphrey sought to have either the interior or commerce committee go into the matter. Investigation also was called for by House members.

Counterattack . . . Coming to McKay's defense, Sen. Arthur V. Watkins of Utah warned that if a probe is started he will see that the record of McKay's Democratic predecessors on wildlife protection is dragged in.

"It is to the secretary's credit that he did not attempt to make administration of the wildlife refuges a political football when he stopped leasing in 1953 and ordered a thorough study of this matter," Watkins asserted. "If the issuance of one lease in 1955 is such a horrible crime against conservation, then certainly the large number of leases applied for and granted prior to Secretary McKay's administration are even more worthy of investigation."

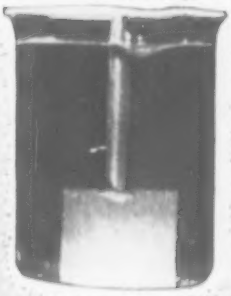
Oil and gas leasing of wildlife refuges was authorized by Congress in the Mineral Leasing Act of 1920. Prior to the suspension of leasing in August 1953 the department granted 23 leases which are still in effect. A half-dozen leases were issued during the period of suspension, where unit plans were submitted which were satisfactory to the department. The first discovery of oil in Nevada was on one of these areas.

A New, Better Coagulant

NALCO 600

POLYELECTROLYTE

Alum



Alum plus
typical polyelectrolyte

Alum plus
Nalco 600

● As a coagulant in water clarification, and under many process coagulation conditions, new and different Nalco 600 has shown such great promise, both in performance and economy characteristics, that it has now been made available for general use as an established member of the Nalco family of chemical aids to industry.

Extremely difficult coagulation conditions provide especially economical applications for Nalco 600. It can be used alone or in conjunction with other coagulants. A very low dosage of Nalco 600 usually permits as much as 50% reduction in dosage of alum, activated silica, iron sulfate or clay type treatments . . . and results in a cleaner, clearer supernatant liquid.

Nalco 600 was invented in the Nalco Laboratories, and is being manufactured *only* by Nalco. For complete data on Nalco 600, and expert technical assistance to solve your clarification and coagulation problems, call Nalco now.

NATIONAL ALUMINATE CORPORATION

Telephone: POrtsmouth 7-7240
6242 West 66th Place • Chicago 38, Illinois
IN CANADA: Alchem Limited, Burlington, Ontario
NORTHWESTERN UNITED STATES, HAWAII and ALASKA
The Flox Company, Inc., Minneapolis 3, Minnesota
ITALY: Nalco Italiana, S. p. A. SPAIN: Nalco Espanola, S. A.
WEST GERMANY: Deutsche Nalco-Chemie GmbH

ANOTHER *Nalco*® **PRODUCT. Serving Industry through Practical Applied Science**

Oil Plan in Danger

● Powerful Colorado bloc opens fight in legislature against conservation idea

DENVER.—The oil conservation program of Gov. Ed C. Johnson is threatened with major-league opposition in the Colorado legislature.

Johnson in his opening-day message to the 1956 assembly asked that the Oil and Gas Conservation Commission be given power to order reinjection of natural gas into the ground and limit oil-field production. He said this is needed to preserve pressure in the Rangely field where gas now is being flared.

Warwick M. Downing, commission chairman, estimates the state may lose $40 million in taxes if flaring continues. He also says a new law would result in recovery of 250 to 300 million barrels of oil unobtainable under primary recovery. An earlier law was declared unconstitutional by the state supreme court.

State Sen. Sam T. Taylor, Democratic floor leader, introduced the bill asked by Johnson. It would give the commission "authority to prevent waste and protect correlative rights of all owners in each and every field and pool" "if commission found emergency existed." Where irreparable harm may occur," the agency could stop production of oil and gas in any pool.

Opposition quickly formed to the proposal. It came from Sen. Frank L. Gill, Republican, senate president pro tem; Sen. Edgar A. Elliff, state G.O.P. chairman; Rep. David A. Hamil, Republican, speaker of the house; and Rep. Ed Harding, a member of the governor's Democratic party.

Four senators led by Gill also unsuccessfully opposed confirmation of Downing to a new term on the commission. They also talked of trying to abolish the commission and give its duties to the State Public Utilities Commission.

Harding said Downing's claim on Rangely field oil recovery was "completely out of line with the facts." He added the oil industry's side of the controversy has not been brought before the public.

Oklahoma Test Cores On

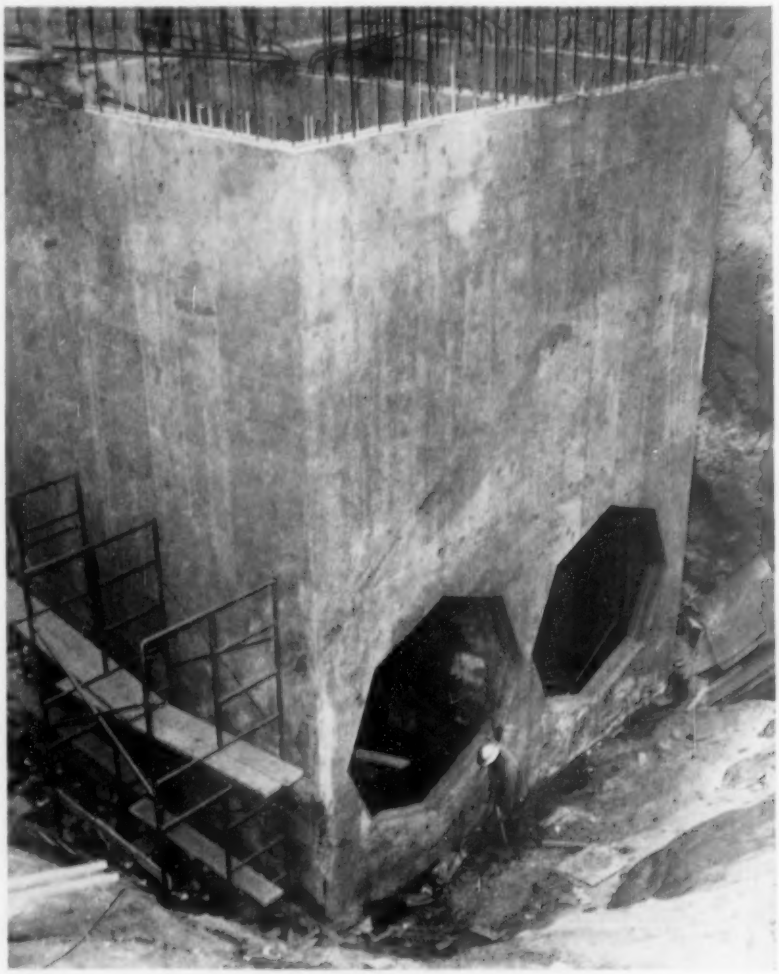
CHICKASHA, Okla.—British-American Oil Producing Co.'s 2 Harrison, a prospective new record deep producer for Oklahoma, was coring slowly ahead last week through what is believed to be the third Bromide sand.

At midweek, the deep test reached 15,212 ft. Coring was through hard, tight sand at a slow 129-minute per foot rate.

The wildcat entered this sand at 15,139 ft. after emerging from what was tentatively called the second Bromide at 15,057 ft. and drilling a shale break.

The well kicked strongly in this shallower Bromide pay and on drillstem test developed a maximum flow of 13,750,000 cu. ft. of gas daily from about 14,977 ft. in open hole *(The Oil and Gas Journal, January 9, 1956, page 64)*.

No further tests were run and prospects are that British-American will drill through the lower sand at least before attempting completion. The 2 Harrison is in Carter-Knox field in the southeastern part of Grady County.



Waterfalls Installed at Huge Refinery

DELAWARE CITY, Del.—Some way had to be found to check the thundering force of water discharged from Tide Water Associated Oil Co.'s giant refinery being built here into the Delaware River.

The solution is this concrete waterfall being installed underground at the site of the 130,000-bbl. daily refinery. Water will pour down this drop in a veritable cascade, invisible aboveground, in times of heavy rain. Storm drainage from the sprawling site will be directed through pipes into the water drop. After the 20-ft. plunge to the bottom, the water will flow through more pipes to the river.

A similar installation will be constructed in the underground water-cooling system. The system will have a big disposal job, as it will draw 275,000 gal. of water per minute from the river. The water will be circulated through 3 miles of 7-in. diameter concrete cooling pipe and then returned to the river. The flow will be slowed considerably by the waterfall before it is discharged.

Dowell engineers tailor Sandlock treatment to your well after thorough study of well information.

SANDLOCK

shuts out sand with plastic-coated walnut shells

SANDLOCK*, an exclusive new Dowell service, creates a permeable network of crushed walnut shells coated with plastic to control unconsolidated sand.

In a Sandlock treatment, crushed, graded walnut shells are coated with unset plastic. The coated shells are mixed into oil and displaced into the formation. The plastic hardens, forming a strongly consolidated, highly permeable network that needs no retaining screens or liners. Working time can be varied from 1 to 15 hours. Shut-in time is normally less than 24 hours.

In tests, Sandlock networks have shown tensile and compressive strengths comparable to sandstone and virtually complete resistance to sand erosion. Tests also indicated that a Sandlock network will prevent the production of all sand that is retained on a 140 mesh standard sieve.

If incompetent sand is hindering production from your well, talk it over with a Dowell engineer. For Sandlock service, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department A-11.

*Service Mark of Dowell Incorporated

services for the oil industry DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

Auto Changes Coming

- **But engineers see evolution, not revolution, with octane requirements to keep refiners' feet to the fire**

- **Gas turbines should make their appearance in luxury cars, trucks, or buses in 10 years, but won't take over**

DETROIT.—A lot of changes are going to take place in the family car during the next 10 years. But just what they will amount to seems fairly uncertain at this point.

In looking at all angles last week, a faculty group from the University of Michigan gave the gas turbine a qualified nod but by no means ruled out the conventional reciprocating engine, the diesel, or the free-piston engine.

In the symposium on "The Next Decade and the Automobile," presented before the national annual meeting of the Society of Automotive Engineers, the authors weighed a large number of important factors which will determine future refining techniques. They refrained from startling predictions, but aired a number of views of interest to the petroleum industry.

Tomorrow's piston engine . . . Looking first at today's reciprocating engine, they saw room for improvement in four directions:

. . . Higher compression ratios.
. . . More super charging.
. . . Fuel injection.
. . . Air cooling.

A 20 per cent increase and a 25 per cent improvement in thermal efficiency would result from increasing compression ratios from 8:1 to 20:1. While this looks impressive, they pointed out that the gains from 14:1 to 20:1 would be outweighed by difficulties in fuel octane and mechanical requirements. So consideration of increased ratios should be limited to about 12:1.

With all mechanical octanes built into engines of the future, they believe that compression ratios of 12:1 could be satisfied with 100 octane number fuels. Noting some new interest in operating economy on the part of drivers, they conclude that future reactions of this mileage-conscious group may have a bearing on the outcome of the compression ratio race.

For larger compression-ratio increases, the authors felt that the diesel cycle might better meet designers' problems, particularly if fuel injection takes the place of carburetion.

The uses of either supercharging and fuel injection should not be discounted in the possible evoluation of the reciprocating engine to higher levels of usefulness. In addition, the authors noted a trend toward air cooling abroad, and suggested that an unprejudiced estimate of this development be undertaken.

Admitting certain difficulties of the air-cooled engine, they declared they do not seem unsurmountable and called for a good look at this type of engine for the future.

Gas turbine promising . . . The gas-turbine engine holds much promise in the automotive field, but also poses a great many serious problems before it can become competitive.

In looking at both sides, the authors arrived at the popular conclusion that much remains to be done to make the gas turbine successful in the everyday automobile.

As they see it, use of this power plant will grow gradually, entering the field from the luxury vehicle where price, operating costs, etc., are of little moment. They then predict that it will gradually expand its field, as justified by operating and manufacturing costs, down into the lower-price field.

"It may never replace the reciprocating engine completely in the highly competitive field unless such items as lubricating oil, cost, service difficulties, repairs, and maintenance prove extremely attractive," they concluded.

Another route by which the gas turbine may enter the field is in buses and trucks. The development of super express highways will permit more of these heavy vehicles to operate at full power over long periods. Since this is the range which best suits the gas turbine, the authors stated that if gas turbines are used in vehicles, one might expect their first application to be on intercity trucks and buses.

Other possibilities . . . Development of the free-piston engine is not as far along as the gas turbine, but it shows promise, the authors said.

Underscoring the completely open field covered by their subject, they pointed to still other prospects in the future of the automobile. For the short-range second car, they see the possibility of a return to the electric motor driven vehicle. It could be equipped with a gas turbine-driven electric generator which would recharge batteries when necessary.

Still another possibility is the use of two small gas turbines in parallel. One would be in constant use and the second only when high-speed or high-torque demands are necessary.

For the next decade, the authors appeared to favor evolutionary but not revolutionary developments in the automobile. From their collective conclusions, it would appear that refiners will face the prospect of higher octanes for improved reciprocating engines for several years yet to come.

The Index Is Ready!

It's FREE—and available. For your copy of the Journal's detailed 1955 index, just drop a letter or post card to:

Reader Service Department
The Oil and Gas Journal
Box 1260
Tulsa, Okla.

Your copy will be forwarded in short order. It's a handy thing to have around. It lists all the major articles printed during 1955, broken down by industry division and by subject within each division. It also lists all articles according to their author.

Make sure you get your copy by getting a note in the mail today!

Transco to Expand

Another big outlay follows $50-million growth in 1955

HOUSTON. — Transcontinental Gas Pipe Line Corp. will spend between 35 and 50 million dollars on expansion this year, hard on the heels of an $80 million expansion in 1955.

Exact plans haven't jelled. But Tom P. Walker, Transco president, told stockholders at a special meeting the company will add some 60,000,000 cu. ft. daily to its main-line capacity, probably by looping.

This would increase the system's capacity to 765,000,000 cu. ft. Another 136,000,000 cu. ft. can be added to peak-day deliverability in the East by withdrawals from underground storage.

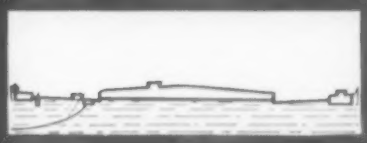
Two plans won stockholders' approval at the meeting. Stockholders voted a two for one split of the company's 3,530,000 outstanding shares of common stock and an increase in authorized common from 5,000,000 to 10,000,000 shares. They also adopted a stock-option plan designed to attract and retain key personnel.

General American

offers you the best in

All types of Floating Roofs

WIGGINS HIDEK*



WIGGINS LODEK*

WIGGINS DOUBLEDEK*

WIGGINS FLOATING ROOFS PAY FOR THEMSELVES

Whatever your Floating Roof requirements get General American's UNBIASED analysis. Unbiased because General American makes ALL types of Floating Roofs!

Wiggins Floating Roofs, Dry Seal Gasholders, Lifter Roofs, Cone Roofs

*patented

GENERAL AMERICA

TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street • Chicago 90, Illinois

Non-Manual Weld Sought

Processes now popular in shops and labs being studied for use on pipeline rights-of-way, contractors told

BOCA RATON, Fla.—Several welding processes are now being studied which, if perfected, could bring tremendous changes in pipeline construction.

Object of each is to introduce a method for pipeline welding which does not depend on manual skill. Observers hope at least one may be the answer. If so, it will mean progress in the next 20 years as great as the transition from screw pipe to arc welding.

Three likely techniques for use in non-manual welding on pipelines are:

Carbon dioxide welding: This is in the lab stage but now appears to be the most attractive of the non-manual techniques. It consists of using a consumable wire electrode within an atmosphere of carbon dioxide.

Induction pressure: This process might be given more serious attention if the defects in the carbon dioxide process cannot be cured.

Thermit welding: This is an old and simple method now being examined for use in the field on small-diameter lines, especially where only unskilled labor is available. It is hoped that improvements may lead to its use on lines of larger diameter.

These and other studies of welding processes being made by Esso Research & Engineering Co. will be outlined this week by Paul Reed, pipeline editor of The Oil and Gas Journal, before the eighth annual convention of the Pipe Line Contractors Association.

Other speakers on the 4-day program include W. C. McGee, Jr., vice president of Tennessee Gas Transmission Co., Houston; Frank M. Porter, president, American Petroleum Institute, New York; Gordan Dean of Lehman Brothers and former chairman of Atomic Energy Commission, New York.

There has been a growing use of non-manual welding techniques. But Reed noted that to date it's been largely in shop work.

Carbon dioxide . . . This process seems to offer low investment, small power requirements, and easy application.

It is a fast, simple, low-cost method which is an offshoot from the inert gas shielded metallic arc process. With carbon dioxide, there is a shorter, hotter arc with deeper penetration than with argon or helium.

The entire welding apparatus rotates on the pipe. Operation can be by push button. The operator needs no manual skill, and he can learn how to run the machine in a few hours. If he is an experienced welder, he naturally will be a better operator. He can watch the weld being made and can correct for faulty operations.

Since carbon dioxide welding is another form of electric arc welding, the weld can be inspected by the same radiographic techniques now being used on pipelines.

Under the process, an 8-in. diameter pipe with ¼ to ⅜-in. wall can be welded in a minute with one bead applied by a single arc. This includes removing the unit and going to the next weld. For larger diameters, it is expected that more arcs could be added to keep welding time down to about 1 minute.

Cost of materials for an 8-in. weld would be 1 cent for carbon dioxide and 5 to 6 cents for welding wire.

Induction heating . . . Methods might be developed for pressure welding which would give more uniform results than heating by oxyacetylene flame.

Therefore, induction heating may have important advantages over the gas pressure welding process widely used in pipelining 12 years ago but finally discarded entirely in 1947. Under the process, an induction coil surrounds the pipe at a distance. The coil itself does not have the high temperature which is induced in the pipe.

The induction process for girth welds is now used only in a few shops. Much development work would be needed to improve it for pipeline welding. Electric generator equipment would be bulky to handle on the right-of-way. But welds could be made on large diameter pipe as fast as on smaller dimensions.

Thermit welding . . . It is one of the oldest processes, and shows promise for pipelining.

Since it was discovered in 1895, it has been used for welding street-car rails, sterns of ships, and reinforcing rods for concrete construction.

The thermit material is a mechanical mixture of finely divided metallic aluminum and iron oxide. A simple mixture of manganese and carbon is added along with such elements as nickel, molybdenum, chromium and vanadium.

When it is fired by ignition powder, a vigorous reaction occurs. Aluminum combines with oxygen of the iron oxide becoming aluminum oxide, leaving metallic iron. The reaction takes 30 seconds and produces a temperature of 5,000° F. The steel formed is highly liquid and separates from the aluminum oxide which floats to the top of the mold as slag.

Inexperienced labor can be quickly taught to make thermit welds. It makes a strong weld quickly and simply. Its drawbacks have been the handling of molds and removal of weld buildup. In commercial applications, thermit has not yet been practicable for pipe larger than 4-in. diameter.

But thermit might be a handy process for use on gathering-line construction, particularly in foreign opeartions when electric arc welding may not be available. Also in cases where welders might not be available for completing the last short stretch of a fairly big job, a simple method not requiring manual skill could be advantageous.

Rubber Sales Hit

West Virginia deal sets off new Senate attacks

WASHINGTON.—Sale of the Government's synthetic rubber plants became another target of political attack last week.

The Senate banking committee may take another look at the sales when it studies the Rubber Disposal Commission's contract to sell the last remaining plant, the 122,000-ton producer at Institute, W. Va., to Goodrich-Gulf Chemicals, Inc., for $11,000,000.

Sale of the Institute plant was negotiated late last year. Attorney General Brownell reportedly gave grudging approval. He is said to have commented that he would have turned the sale down as a violation of the antitrust laws had not the Government been involved.

The commission's report, together with Brownell's opinion, will shortly go to the capitol. Congress has 30 days thereafter in which either house can veto the sale. There is no indication this will be done, however. Even critics of last year's sales say that the Institute plant is fetching more, on a ton basis, than some of the others.

Democratic members of the Senate committee charged last year that the plants were being sold too cheaply. Nevertheless, they went along with the commission's program and approved the sales. Any further inquiry into the matter now can do no more than substantiate the charge of "give-away." Last year's approval cannot now be withdrawn.

Mixed-Up Meter Logs Quakes

MARTINEZ, Calif. — Here's something new in instrumentation.

Shell Chemical Corp. recently discovered it had a combination flowmeter-earthquake recorder operating at its Martinez refinery.

The recorder faithfully measures the volume of secondary butyl alcohol that is fed into the methyl ethyl ketone furnace. But this chore apparently doesn't keep the instrument busy fulltime. It also records earthquakes with an accuracy rivaling the most intricate seismograph.

The first inkling of its versatility came October 24. Yield Clerk Melvin Nunez noticed a sharp displacement of the recording pen coinciding with the time of a tremor which shook Contra Costa County the night before. The instrument behaved the same way during each aftershock.

Nunez decided to capitalize on its unusual ability. He drew up a scale by which he could quickly compute the Richter magnitude of the shakes from the jiggle of the flowmeter pen.

On November 10, the refinery area was rocked by another quake. The flowmeter performed like a champion. It recorded the magnitude of the tremor within a fraction of the figure shown on the neighboring University of California seismograph. Nunez explains the university's instrument was slightly off.

MELVIN NUNEZ points to a flowmeter that acts like a seismograph at Shell Chemical's Martinez refinery.

The clincher came November 12. Nunez noted a disturbance on the flowmeter which the papers failed to mention. Somewhat shaken, he called the university. Sure enough there had been a slight earthquake the night before and the flowmeter's estimate of the severity was right on the button.

Strangely, all the other charts at the installation remain normal during the quakes. There's another flowmeter attached to the same steel frame just a foot from the double-duty model. But all it does is record flowrates.

L.P.G. Line Planned

● T.G.T. discloses project to move butane 200 miles to Houston terminal

HOUSTON.—Tennessee Gas Transmission Co. plans a pipeline to transport butane more than 200 miles across southern Texas for use in manufacture of butadiene.

The pipeline would extend from the company's natural-gasoline plant near Banquette, west of Corpus Christi, to the Houston area. Butane moved through the line would be sold to Petro-Tex Chemical Corp., which operates one of the nation's largest butadiene plants here.

Petro-Tex Chemical is jointly owned by Tennessee Gas and Food Machinery & Chemical Corp. It recently started a long-range expansion program intended to boost capacity of the Houston plant by about 50 per cent. The plant now has a capacity to produce 90,000 short tons of butadiene annually.

Plans for the line were revealed by T.G.T. during negotiations with Houston Navigation District Port Commission. The pipeline company has sought to purchase a tract of about 50 acres along the Houston Ship Channel.

At that site the company plans to build a fractionation plant and storage tanks to handle products shipped from Nueces County gasoline plant.

Mixed stream planned . . . The proposed pipeline also would transport propane and natural gasoline. Products would move in a mixed stream and would be separated at the ship channel terminus. The butane would be moved several miles to the petrochemical plant near Pasadena. Plans also call for possible construction of barge, truck, and rail loading facilities for shipment of liquids not used in the petrochemical plant.

T.G.T. also is planning to lay a short line from the ship channel terminus to the nearby Barbers Hill area, where L.P.G. would be stored underground during all seasons.

Details of the proposed project have not been announced by T.G.T. It is understood, however, that expansion of the butadiene plant hinges to some extent on success in building the pipeline, docks, and storage facilities.

The butadiene plant was the second largest of several such facilities built by the Government during World War II. Petro-Tex paid about $27,000,000 for it last spring.

Contract for new product facilities at the butadiene plant was awarded recently to Bechtel Corp. *(The Oil and Gas Journal, October 17, 1955, page 93).*

W. K. Warren gets $44 million . . .

. . . Gulf-Warren Deal Outlined

WASHINGTON. — W. K. Warren, founder and chairman of the board of Warren Petroleum Corp., will receive $44,000,000 in Gulf Oil Corp. stock from the sale of his Tulsa company.

Warren started with a shoestring natural-gasoline brokerage business in 1922. He built it into a company with 40,000 bbl. daily of crude-oil and natural-gas liquids production and assets of $163,920,000.

His 622,648 shares of stock will be traded for 498,118 shares of Gulf common on a five for four basis. Gulf stock has been selling for about $89 on the New York Stock Exchange.

For the deal to go through, Gulf must acquire at least 1,753,133 of the 1,877,325 shares of Warren outstanding by sometime in March. Gulf filed a registration statement with the Securities and Exchange Commission for 1,534,446 shares which it will use in the purchase.

The statement showed that J. A. LaFortune and Howard E. Felt have agreed to exchange their 298,684 shares of Warren stock on a slightly lower basis. They will receive 18 shares of Gulf for each 25 shares of Warren.

All other Warren stockholders will be offered the five for four exchange up to the March deadline. Gulf is expected to have no trouble getting commitments on the additional stock needed for the transaction to go through.

The registration statement said that Warren will be operated as a subsidiary. The only change in management or other personnel will be the resignation of J. A. Padon, a vice president and director who was a key figure in negotiating the sale of Warren.

Lee Kaiser of San Francisco was the other principal in negotiations. Both will be paid $50,000 a year for 10 years.

El Paso Moving Fast

● Big gas firm plans products pipeline, alkylation plant, blending plant to step up refining-marketing activities

EL PASO.—El Paso Natural Gas Co. made another move last week in its drive to become a significant refiner and marketer of motor gasoline and other oil products.

The big gas producing and transmission firm revealed it will lay a new 240-mile "larger-than-6-in." products pipeline from the Permian basin to El Paso. Start of the line probably will be in the vicinity of El Paso Natural's Midkiff natural-gasoline plant in Midland County, Texas.

The new products line will carry natural gasoline, butane, and propane.

El Paso Natural also will build an alkylation plant of as yet undetermined size somewhere on the route of the new products line. El Paso Natural officials said the alkylate will be piped on through the line to El Paso. It will be blended there at a projected new blending plant into premium motor fuel with regular motor gasoline arriving from a recently acquired refinery at Brickland, N. M.

El Paso Natural acquired the 3,200-bbl. Brickland refinery, seven product terminals, and about 125 retail outlets in West Texas, Arizona, and New Mexico when it absorbed McNutt Oil & Refining Co. in October through an exchange of stock *(The Oil and Gas Journal, October 24, 1955, page 59)*.

El Paso Natural, in a more recent deal, is buying two more refineries at Prewitt and Bloomfield, N. M., in the San Juan Basin from Malco Refineries, Inc. An El Paso official said it is likely the new alkylation plant later will supply alkylate for upgrading regular gasoline to premium fuel at these plants.

New company . . . All of the El Paso refining, marketing, and products-line activities have been turned over to a newly organized subsidiary, El Paso Natural Gas Products Co.

The new company is headed by Paul Kayser, president of El Paso Natural Gas. C. L. Moore, formerly assistant general superintendent of the parent firm, will be vice president and general manager, and Cecil E. McNutt, former vice president and general manager of McNutt Oil & Refining, will be vice president and operating manager of refineries.

El Paso Natural Gas Products also will administer El Paso's half interest in the new butadiene plant the company is building jointly with General Tire & Rubber Co. near Odessa, Tex. *(The Oil and Gas Journal, December 26, 1955, page 123)*.

The new-born El Paso subsidiary already is hard at work studying location of new motor-fuel marketing outlets in the West Texas, New Mexico, Arizona areas.

Present plans are to continue marketing regular gasoline under the "Dixie" brand name at the stations acquired from McNutt Oil & Refining. This decision may be changed later. The company is working to develop a new brand name for the new premium fuel it will have for market when the new products line, and blending and alkylation plants are in operation.

California Gas Needs Cited

LOS ANGELES. — Spokesmen for two California companies testified before the State Utilities Commission last week that southern California is growing so rapidly that pipeline capacities for bringing natural gas to the area must be doubled.

The hearing was called to consider application of Southern California Gas Co. and Southern Counties Gas Co. to construct a 236-mile, 30-in. pipeline from Topock, Ariz., to Newhall, Calif. The companies now jointly operate a 30-in. line from Blythe, on the Arizona border, to Santa Fe Springs in the Los Angeles Basin.

If the project is approved, construction on the $30,750,000 pipeline will begin immediately. Upon completion, tentatively set for 1959, the two pipelines will enable the companies to boost their imports from the El Paso Natural Gas Co. by 177,000 M.c.f. daily.

Newcomer in Mid-Continent

TULSA.—Great Sweet Grass Oils, Ltd., Toronto, in its first Mid-Continent venture, has bought 48 Oklahoma wells currently producing about 1,400 bbl. daily. The purchase also included 8,400 acres of undeveloped leases.

The wells and acreage were held by Depositers Mutual Oil Development Corp. Bulk of production, scattered through five counties, has been proved within the last 18 months, with all wells flowing natural. Reserves are estimated at 8,000,000 bbl.

Industry BRIEFS

DENVER.—Shawnee Oil Co., recently incorporated in Colorado, has opened temporary Denver offices. The new firm will specialize in exploration and production in northeast Colorado and the Nebraska panhandle. The company was organized by Frank O. Prior, Jr., Robert E. Chancellor, and I. J. Gefroh, all of Denver.

LOS ANGELES.—The fluid catalytic cracking plant of Shell Oil Co.'s new 50,000-bbl. refinery near Anacortes, Wash., has gone on stream. Initial operation of the unit marks completion of the refinery.

The 23,000-bbl. cracking plant employs a new technique to achieve a substantially greater high-octane gasoline yield. Shell plans to release specific performance details on novel features of the process this spring.

ABILENE, Tex. — Jameson field, cut back in December to only 5 producing days for excessive gas flaring, was restored to Texas' statewide 17-day pattern for the rest of January. The Texas Railroad Commission restored the Coke County field to the statewide pattern when El Paso Natural Gas Co. completed a new 50-mile, 14-in. pipeline to the field to handle the excess gas. The line connects with the El Paso system at that company's Midkiff gasoline plant in Upton County.

LOS ANGELES. — General Petroleum Corp. has purchased the capital stock of Wilmington Gasoline Co., which operates a natural gasoline plant on Terminal Island to process gas from the Wilmington field. General executives have been named officers of the gasoline firm and General will operate it as a subsidiary.

DENVER.—Texas-Adams Oil Co., Inc., has acquired the assets of Homestead Oil & Uranium Co. Both firms are headquartered here. Homestead shareholders received one share of Texas-Adams for each 25 shares of Homestead. William J. McCarthy, president of Texas-Adams, also disclosed his firm has bought Empire Drilling Co., Dallas, and "will continue diversifying."

WICHITA FALLS, Tex.—King Oil, Inc., Wichita Falls independent, has been absorbed by Fremont Uranium Corp., Denver, in a stock transfer deal. King Oil, with about 300 bbl. daily oil production in Texas and Oklahoma plus undeveloped acreage, will operate as a Fremont subsidiary.

Down time is no joke.

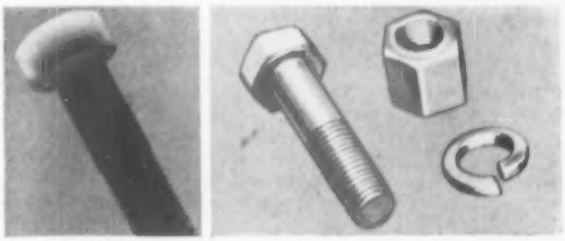
But it happens at times when track hardware gives out.

If you replace with original Caterpillar hardware, here's what you're sure of: bolts, nuts, capscrews and lock washers made from prechecked fine-grade steels, carefully hardened and tested, finished to the strictest specifications in the industry. You're sure of longer wear life, no matter how tough your jobs come. You're sure of *less* down time in the future.

If you replace with substitute hardware—can you be sure of anything?

Better get Caterpillar parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.



On the surface, CAT® hardware looks like ordinary kind. But etched cross section of newly designed track bolt (left) shows depth of special "Hi-Electro" hardening penetration in bolt head.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Deep Well Liner Stuck

New trouble plagues Richardson & Bass after hole drilled to new record 22,570 ft., log shows 3 possible pay zones

PORT SULPHUR, La.—The world's deepest well has run into new trouble. A liner is stuck in the open hole 770 ft. off bottom.

This development came late last week while operators were running the liner. Richardson & Bass had been able to ream back to bottom after previous trouble and had deepened the hole 11 ft. for a new world's depth record of 22,570 ft.

They were preparing to test three new prospective pay zones, all below 21,535 ft.

Crew members backed off the drill pipe from the liner and then began pulling pipe.

Richardson & Bass officials say they think the trouble is not as bad as it could be. They plan this week to try to cement the liner in place. Further plans will have to wait outcome of this job.

Prospects . . . An electric log was run on the 1-L Humble-LL&E-State Lease 2414 on the Louisiana coast after total depth was reached.

It showed three good prospective pay zones at 21,535-85 ft., and 22,255-22,385 ft., and 22,515-19 ft.

Only the top one of these is behind the liner.

Month of trouble . . . Richardson & Bass first had reached 22,559 ft. on December 8, 1955, when the well kicked.

It took 2 weeks before the well could be brought under control and still another 2 weeks before the hole could be reamed to bottom.

During the first week after the well kicked, the blowout preventers had held pressures near 2,000 psi. while drill pipe was being snubbed into the hole. Pressure was relieved by circulating out 18-lb. mud which had been cut by oil and gas. A mud weighing 18.5 lb. per gal. brought the well under control.

Richardson & Bass then reached the bottom of the 7-in. liner at 19,752 ft. with the drill string late in December. Workers spent over 2 weeks more reaming the open hole back to bottom. It was reached early last week, and the well deepened 11 ft. "just for luck."

After bottoming the well and running the electric log, operators spent nearly 18 hours conditioning the hole before pulling out the drill string to run the liner. Complete circulation of the hole required about 9 hours. The extra time was needed to make sure all loose shale and cuttings were out of the hole. Walls below the liner had sloughed badly. Large quantities of "saw tooth" shale were circulated out.

Special care was taken in pulling out drill pipe to be sure the well didn't swab in again and repeat the blowout conditions.

Drill pipe used to lower the liner into the hole was about 13,000 ft. of 4-in. and 6,500 ft. of 2⅞-in. The liner string was made up of 5-in. 18-lb. super deep-well casing with flush joints. Hole size was 6-in. The liner was run on the drill pipe to 21,800 ft. where it became stuck and could not be freed.

Minerals Ruling Due

Railroad defends claims to rights under right-of-way

DENVER.—Three federal judges will decide within the next 30 to 90 days who owns mineral rights under a railroad right-of-way land grant.

The three judges comprise the U. S. 10th Circuit Court of Appeals. Last week they heard arguments of a dispute between Union Pacific Railroad and the federal Government over rights to minerals under the railroad's Wyoming right-of-way. The Government is appealing a decision favorable to Union Pacific. It was handed down in December 1954 by U. S. District Judge T. Blake Kennedy, Cheyenne, now retired.

Judge Kennedy ruled that under a congressional act of July 1, 1862, the railroad was granted a limited fee in right-of-way. Kennedy ruled the railroad was entitled "to develop and remove minerals under that right-of-way."

The case involves a U. P. plan to drill for oil on its main line at Borie Junction, between Cheyenne and Laramie, Wyo.

Judge Kennedy conceded that the decision entered "virgin territory." But he said his court, owing to lack of precedent, was taking the first step in getting a clear-cut decision.

In the appeal hearing, William W. Clary, railroad attorney, contended the carrier's mineral rights would terminate only when the right-of-way above ceased to be used for railroad or telegraphic purposes.

Attorney Fred W. Smith of the Justice Department's land division argued that the Cheyenne district court erred in its decision. And he challenged anew Union Pacific's right to drill on the property.

Price Plea Revived

California producers cite need for boost

LOS ANGELES.—The battle for another crude price raise in California was renewed last week by R. R. Von Hagen, president of the Oil Producers Agency.

In a letter to members of the agency, Von Hagen pointed out that since 1953 nonintegrated oil-producing companies have seen their per well income drop 9 per cent and their costs jump 20 per cent.

"It is apparent that present crude prices in California must be revised upward if the state's oil-producing industry, particularly the nonintegrated companies with nearly 382,000 bbl. of daily production, is to remain economically healthy and thus able to maintain and increase supply to meet constantly increasing demand, Von Hagen said in the letter.

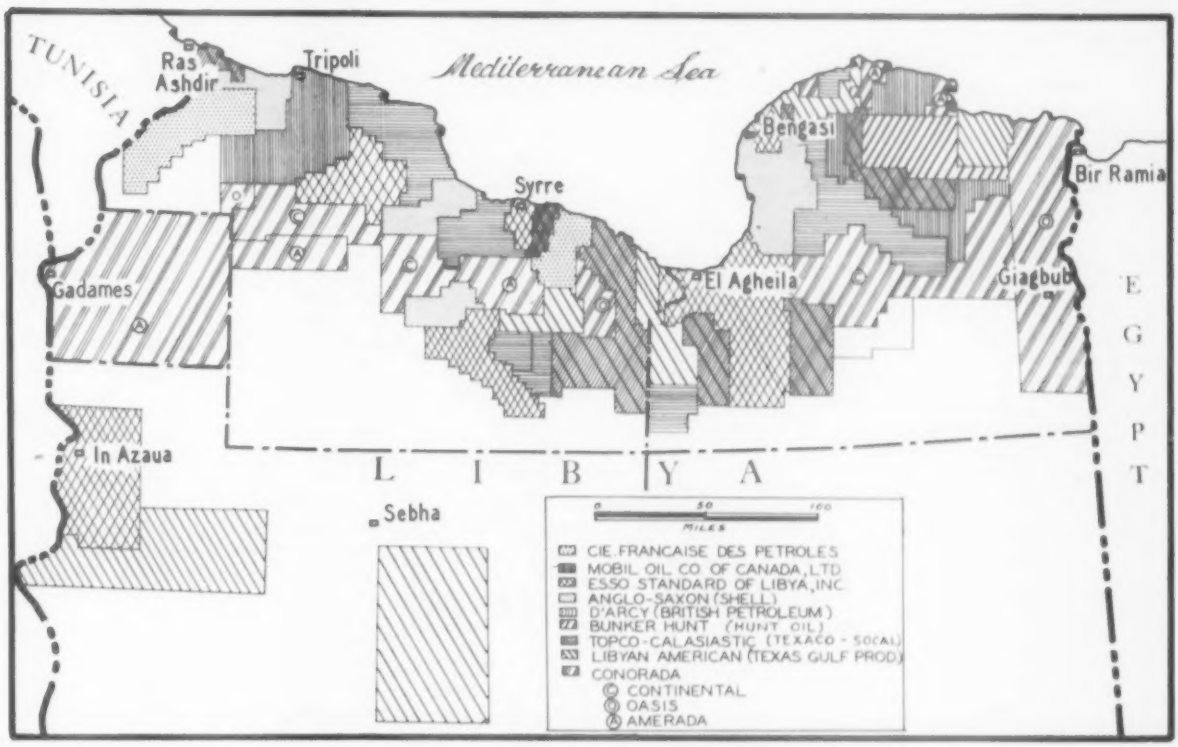
The nonintegrated companies operate 51 per cent of the state's wells and have 39.4 per cent of California's production. As of September 30, 1955, this amounted to 17,380 wells producing 381,850 bbl. daily. That's an average of 22 bbl. per well. The per well daily income in 1955 was about $55.22 while in 1953 it was $60.51, Von Hagen stated.

The last crude price raise in California was October 17 when heavy crudes and residual fuels received a boost. The raise started with 10 cents for 14°-gravity and under crudes and gradually lessened to no increase for crudes 26° gravity and above. Heavy fuel prices were raised 15 cents a barrel and distillate fuel oils 20 cents a barrel.

Lawton Oil Corp. Sold

DENVER.—Colorado Oil & Gas Corp. has acquired Lawton Oil Corp. of Magnolia, Ark., in a stock exchange deal. Lawton Oil shareholders received 150,000 shares of Colorado Oil & Gas common for their interests.

The acquisition will increase daily oil production of Colorado Oil & Gas by 1,500 bbl. to a total of 6,500 bbl. Lawton's producing properties are located principally in Arkansas, New Mexico, and Texas. It also holds 35,000 acres net interest in 129,000 acres of unproven leases in the South Mid-Continent area.



Concession picture jells, clearing decks for . . .

Thirteen Firms to Start Libyan Search

MORE than 91 million acres of exploratory concessions have already been granted by the Libyan Government.

Ten of the 14 companies seeking acreage received that much. The acreage allotted three more firms has been selected, but if the concessions have actually been granted there has been no official announcement. One company, declared ineligible by the government, failed to get acreage.

The allocations, which make the two northern provinces of Libya look like a patchwork quilt (see map) are the products of negotiations between the companies and the government. The talks began last October 3 after the original applications for concessions overlapped almost hopelessly.

The new Libyan oil law provides for rival applicants to work out conflicting claims to acreage, or for a settlement by the country's petroleum commission.

Before those conferences began, the petroleum commission established the eligibility of all the companies except Pan Coastal Petroleum Co., C.A. The company said 3 months ago it was still trying to become eligible, but it was not granted acreage.

New concessions . . . Two major American oil companies last week were the latest to disclose concession acreage in the country.

A subsidiary of Socony Mobil Oil Co., Inc., has obtained a total of 11,563,305 acres in seven different tracts in Tripolitania and northern Cyrenaica. Standard Oil Co. (N. J.) was one of the first to receive acreage when it was granted nearly 5,000,000 acres in Fezzan. Last week Jersey Standard could add another five tracts totaling 13,500,000 acres in Tripolitania and northern Cyrenaica.

The concessions allotted to D'Arcy Exploration Co. (British Petroleum Co.), the Royal Dutch-Shell group, and Hunt Oil Co., Dallas, have already been selected but none of the three companies has disclosed any acreage figures.

The petroleum law fixes royalty to the government at 12½ per cent and a 50-50 profit split is required after production reaches 15,000 bbl. It requires an operator to begin an active exploration program within 8 months after receiving his concession.

Other operators . . . Libyan American Oil Co., wholly owned subsidiary of Texas Gulf Producing Co., has already announced it intends to start its first well by April (*The Oil and Gas Journal, December 5, 1955, page 95*).

In addition, concessions are held by Cie. Francaise des Petroles; Texaco Overseas Petroleum Co. (The Texas Co.) and California Asiatic Oil Co. (Standard Oil Co. of California); and the Conorada group, including Amerada Petroleum Corp. of Libya, Continental Oil Co. of Libya, and Oasis Oil Co. (Ohio Oil Co.).

Topco and Calasiatic have undivided one-half interests in six concessions covering 14,200,000 acres. The two parent companies, which comprise Caltex, did not take out the acreage as Caltex. American Overseas Petroleum, Ltd. (Caltex), has carried geological and geophysical exploration in Libya for 2 years.

Turkey Grants Acreage

Seven companies win exploration concessions in popular Thrace area; other deals await settlement of overlaps

SEVEN companies have been granted exploratory licenses in Thrace, the European portion of Turkey which borders Greece and Bulgaria.

Unofficial reports from Turkey last week listed the concessions but gave no acreage figures from the tracts allotted the seven companies.

Four concessions each went to American Overseas Petroleum, Ltd. (Caltex); N.V. de Bataafsche Mij. (Royal Dutch-Shell); Esso Standard (Turkey), Inc. (Jersey Standard); and C. Deilmann Bergbau G.m.b.H., the German firm. Tide Water Associated Oil Co. received three concessions and Husky Oil Co., Cody, Wyo., and Istanbul Gas Co., one each.

Bolsa Chica Oil Corp., Los Angeles, has been granted two concessions in the Siirt zone. Tide Water and Gilliland Oil Corp., Los Angeles, were each awarded a concession in the Antalya zone.

Other applications pending . . . Eleven of the twelve companies seeking concessions in Turkey under the new petroleum law asked for acreage in Thrace where oil seeps have been known for years.

At least half of them asked for the maximum of eight licenses allowed under the law. Negotiations between the rival applicants and Turkish Petroleum Commission authorities have apparently solved at least a part of the conflicts in this area.

The country's new oil law divides Turkey into nine exploratory zones. Two of them bordering the Black Sea and Soviet Russia in northwestern Turkey are only partially open. In addition to Zone 1, which includes Thrace, Zone 5 was a popular region with 47 separate requests for acreage. Zone 5 includes the Mardin basin. Adjoining Zone 5 on the east, Zone 6 had 39 applications and Zone 7, the Adana region, had 28 separate applications for acreage.

As soon as the Thrace region overlaps are completely resolved and the acreage allocated, negotiations are expected to begin to solve the conflicts in the Mardin basin area in Zone 5. This zone contains Ramandag and Garzan fields, Turkey's only oil production. The new law provides that they will be taken over by the newly formed Turkey Petroleum, Inc., in which the government holds 51 per cent interest.

Five companies have already been granted exclusive 6-year exploratory concessions covering 14 separate tracts of roughly 50,000 hectares (about 123,500 acres) each. The 14 prospecting concessions were granted shortly after applications were made because they did not involve any conflicts *(The Oil and Gas Journal, December 12, 1955, page 77).*

Belayim Extended

Test taps new, deep zone in Sinai Peninsula field

INTERNATIONAL EGYPTIAN OIL CO. has brought in a wildcat in Egypt's Sinai Peninsula, extending southern productive limits of its Belayim field 3½ miles. The well flowed 55 bbl. of 22°-gravity clean oil on its initial test.

One hundred feet of oil sand was cored recently in a lower Miocene zone from 8,130 to 8,265 ft., company officials said. The first open hole drillstem test was from the upper 40 ft. of this interval.

The well, Belayim 113-1, was spudded in September to confirm seismic indications that the newly discovered lower Miocene zone is extensive. The new and deeper zone was found first in Belayim 112-2. That well was completed flowing 5,000 bbl. daily through an open choke from 8,580-8,660 ft. after six productive horizons were encountered.

Five other producing wells in the original Belayim discovery area were completed in formations from 800 to 1,000 ft. shallower. The virgin area is north of the latest discovery.

Besides the seven Belayim producers, the company has four more wells in Feiran field several miles to the north.

International Egyptian is owned by the Belgian company, Cie. Financiere des Petroles (Petrofine), the Italian Government's Azienda Generale Petroli (A.G.I.P.), Swiss banking interests, and Southern California Petroleum Corp. The American firm, a minority stockholder, is operator for the group.

Now the Arabs Can Say It

Egyptian - American Oil Co., has changed its name to Sahara Petroleum Co.

Millard K. Neptune, general manager, said the change in name was advisable "because of the difficulty Arabic-speaking nationals have in pronouncing the word, 'Egyptian' . . ." He pointed out also that the former name was confusing with those of other companies operating in Egypt.

The company is exploring for oil on a 60,000,000-acre concession granted by Egypt in 1954 to Continental Oil Co., Ohio Oil Co., Richfield Oil Corp., and Cities Service Co. The first test, spudded last summer, is being drilled about 28 miles southwest of Alexandria. Drilling is continuing at about 10,000 ft. No commercial oil shows have been recorded.

Russian Bid to Be Beat?

Syria wants to see how the rest of the world will stack up against Russian offers to build a refinery at Banias on the Mediterranean coast.

The Soviets offered to build the refinery at a lower cost than any other available source *(The Oil and Gas Journal, December 19, 1955, page 61).* The Syrian cabinet announced last week it would invite international tenders for the proposed 15,000 to 20,000-bbl. daily refinery. The government has allocated $20 million to build the plant which would supply the country's internal petroleum needs.

Syria will receive the equivalent of almost $20 million a year in royalties from Iraq Petroleum Co., Ltd., for allowing the company to move Iraq crude across the country by pipeline to the Mediterranean *(The Oil and Gas Journal, December 5, 1955, page 95).* The new agreement for increased pipeline rolayties sparked other similar demands. Syria is now negotiating with Trans Arabian Pipeline Co. for more royalty and Lebanon has begun talks with I.P.C. aimed at an increase in royalty for the same purpose.

Australia Well Testing

Cape Range 2, the deepest well yet drilled in Australia and probably the deepest in the Southern Hemisphere, has been plugged back from its total depth of 15,047 ft. for testing up the hole.

West Australian Petroleum Pty., Ltd., is testing a Jurassic section from 9,886 to 10,098 ft. to evaluate the section which showed fluorescence when it was drilled.

Cape Range 2 is about 25 miles north of WAPET's Rough Range discovery. A 30-ft. offset to the original well produced about 400 bbl. of oil daily through a ¼-in. choke from 3,600 ft., but encroachment became marked as tests proceeded. Five other Rough Range offsets were dry.

Monopoly to Stay

New Brazil president to keep out private capital

PRESIDENT-ELECT Juscelino Kubitschek of Brazil offers little hope that his administration will abandon a government-monopoly policy in favor of private-capital development of Brazil's oil.

But, statements made by the incoming president during the past 2 weeks leave little doubt that he intends to do something about the wide gap between the country's oil production and its demand. In statements made in Brazil, he called oil a "priority" concern of his administration. In New York last week he called oil a "No. 1 problem" of his administration.

Before leaving on what he has called a goodwill visit to the United States, Kubitschek said he thinks foreign capital and experience are essential to the development of Brazil's oil. He hastened to add that what he has in mind means no change in the spirit of Brazil's oil legislation or in the setup of Petroleo Brasileiros (Petrobras), the government monopoly. He added that he thinks his plan—whatever it is—should show some concrete improvement in Brazil's oil picture within 3 years.

At a New York press conference last week, Kubitschek said flatly that his administration will maintain Petrobras. He explained that as a democratic regime bound by the laws of the land, his administration can do nothing else.

The 5,200 bbl. daily produced by Petrobras hardly makes a ripple in Brazil's daily consumption of more than 160,000 bbl. The agency's failure to increase output has made it increasingly a target of critics.

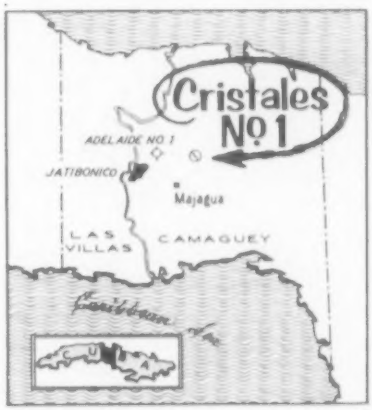
During his campaign for the presidency, Kubitschek said he would wait 1 year after taking office to see if the agency could improve the outlook. Then, he said, he would "seek another solution" *(The Oil and Gas Journal, October 17, 1955, page 106).*

B. P. Attains High Octane

British Petroleum Co., Ltd., is producing a 92-plus research-octane blending component processing Kuwait crude at one of its refineries.

In an announcement made jointly by B.P. and Universal Oil Products Co., the company said the high octane number was achieved by a butane-free Platformate without the addition of tetraethyl lead. It is believed to be the highest octane level ever obtained from a Middle East crude in commercial operation. The company said the reformate is being produced with standard R-5 U.O.P. platforming catalyst produced for B.P. at the Universal Products, Ltd., plant near London.

The announcement did not say where the high-octane reforming operation is taking place, but B.P. has Platformers at its refineries at Aden, Hamburg, Kent, Kwinana, Lavera, and Llandarcy.



New Shows in Cuba

Cuban American test finds four possible pay zones

CUBAN AMERICAN DRILLING & EXPLORATION CO. has picked up several more oil shows at its 1 Cristales wildcat 5 miles northeast of Majagua in Cuba's Camaguey Province.

A Cuban American official reports the venture has found shows at 3,200 ft., 3,800 ft., 4,360 ft., and 4,650 ft. The bit is now approaching 5,000 ft.

The 1 Cristales previously tested and eliminated as noncommercial three oil shows down to 2,000 ft. *(The Oil and Gas Journal, December 12, 1955, page 79).*

For several weeks the test has cut through streaks of serpentine rock, limestones, and black sandy shales. The top two of the recent oil shows are thought noncommercial. The company isn't sure yet about the deeper two.

A drill-stem test was taken of the 4,650-ft. show, the only such test below 2,000 ft. It developed 150 ft. of gas-cut mud. An attempt was made to core the interval but the core was not recovered.

Future plans for setting pipe and coming back up the hole to attempt a completion will depend on what is found deeper and a report of an electric log.

The 1 Cristales is located in the Central basin. It is the second test of company's million-acre-plus concession. The first test, the 1 Adelaide, 9 miles northwest of the 1 Cristales, was abandoned dry at 5,280 ft. in serpentine rocks.

International Briefs

Another new refinery is in sight for Cuba. A group of businessmen there and in Florida have disclosed plans to build a $10-million, 5,000-bbl. daily plant in the island's Port of Cienfugos.

Joining in the venture will be Henry Bobbin, Miami Beach, his brother, Daniel Bobbin, Jacksonville, and Juan Restoy Sanchez and Dr. Nicodemes Viejo Llorente, both of Havana. The Bobbin brothers have trucking and shipping interests in Florida. The proposed refinery is slated for operation late this year.

The Iranian Government has awarded a $700,000 contract for aerial mapping and survey work of all kinds—including geophysical mapping—to Air Survey Co. of London, a subsidiary of Fairey Aviation Co. The company has set up headquarters in Teheran.

J. F. Davis, chief technical officer for Britain's Southeastern Gas Board, predicted last week the agency's Isle of Grain gas works will be producing 20,000,000 cu. ft. of gas daily within 2½ years. British Petroleum Co.'s Kent refinery will furnish a gas-oil feed stock supply of from 1,200 to 1,400 bbl. daily for the plant, Britain's first large-scale unit to produce gas from oil.

Dutch New Guinea Petroleum Co. has asked the Netherlands Government to extend its concession in Dutch New Guinea by another 17,000,000 hectares (nearly 42,000,000 acres). If the request is granted, the company will hold practically all Dutch New Guinea under concession. The company is 40 per cent owned by Royal Dutch-Shell, 40 per cent by Standard-Vacuum Oil Co., and 20 per cent by Far Pacific Investments, Inc.

Tankers accounted for nearly half the total tonnage built in United Kingdom shipyards during 1955. Preliminary figures indicate tanker tonnage totaled 650,000 gross tons of the total 1,300,000 to 1,400,000 tons of shipping turned out by British shipbuilders. About 40 per cent of the tanker tonnage completed last year went to foreign owners.

Shell-D'Arcy Petroleum Development Co. of Nigeria, Ltd., has completed a water-borne seismic survey of all navigable waterways in the Niger Delta. The continuous operation took 2 years and cost more than $500,000. Nine specially fitted boats were used. The survey, which mapped 14,000 sq. miles, is a part of a joint British Petroleum Co., Ltd., Royal Dutch-Shell exploration program *(The Oil and Gas Journal, January 2, page 66).*

Here's how Sharon Ridge Canyon Unit was formed and what it's doing . . .

The discovery reef well in Scurry County was completed in June 1948, and almost 2 years later, in March 1950, the initial producer was completed in the Sharon Ridge area. Development of all Scurry County reef fields has been on 40-acre spacing. The completion practice was usually to drill to an arbitrary level above the anticipated oil-water contact. Depending upon the operator, the wells either have perforated casing set at total depth, or the casing is set at about the top of the reef.

In early 1951, the operators in Sharon Ridge organized an engineering committee to investigate the possibilities of a recovery program through injection of water or gas, or both, and to recommend further plans. The engineering committee concluded that the injection of water was the most desirable, and that such would materially increase recovery.

Unitization . . . Subsequently, the operators considered methods of unitization. The participation formula unanimously adopted by the operators is based 50 per cent on the gross acre-feet of Canyon Reef formation underlying each tract and 50 per cent on the wells on a tract with top well credit being given to producers capable of 50 bbl. per day or more on a 3-day test.

Unit operator . . . Warren Petroleum Corp. has been chosen unit operator and various committees have completed plans to unitize operations for initiating a program of pressure maintenance. The operators have approved the engineering committee proposal for water injection.

Flood patterns . . . The Sharon Ridge plan is the latest to be adopted in the reservoir. The Diamond "M" unit commenced injection of water into three wells in December 1951, and commenced injecting gas into a crestal well in August 1952. At this time, gas injection has been terminated and the water injection program has been expanded into a peripheral pattern. The SACROC unit commenced water injection in September 1954 and the injection wells are located in a line of wells on the crest of the structure. In both of these units, water is injected into the oil column above the oil-water contact.

The Sharon Ridge Engineering Committee believes that maximum oil recovery can be obtained by injecting water into the Canyon Reef both laterally and below the oil-water contact on the periphery of the structure. Approximately every other well on the periphery has been selected for conversion to water injection. The injection wells have been deepened and an interval of from 50 to 100 ft. below the oil-water contact is established as a proper depth to receive the desired injection volumes of water.

Water source . . . Water for the flood is being purchased from the Colorado River Municipal Water District which is impounding water in Lake Thomas. The Sharon Ridge unit has financed construction of a separate 18-in. pipeline for delivery of water to the unit.

In November 1954 it appeared that a sufficient percentage of royalty owners would consent to the unitization agreement, and the operators selected an engineering firm to prepare the design and specifications for the construction of water-treating facilities, pump stations, and a water-distribution system. The design and equipment subcommittee was organized to guide the selected firm.

Commission approval . . . The Sharon Ridge operators secured signatures of 100 per cent of the working interests and 91.6 per cent of the royalty interests, and on January 14, 1955, the operators presented engineering and geological testimony in application to the Railroad Commission of Texas for approval of the Sharon Ridge Canyon unitization and pressure-maintenance plan. It was shown that: (1) the reservoir is a volumetric reservoir and will produce primarily as a dissolved gas drive unless a program of pressure maintenance is instituted, (2) the reservoir rock is well suited to pressure maintenance operation, and (3) institution of a water injection program will increase substantially oil recoveries.

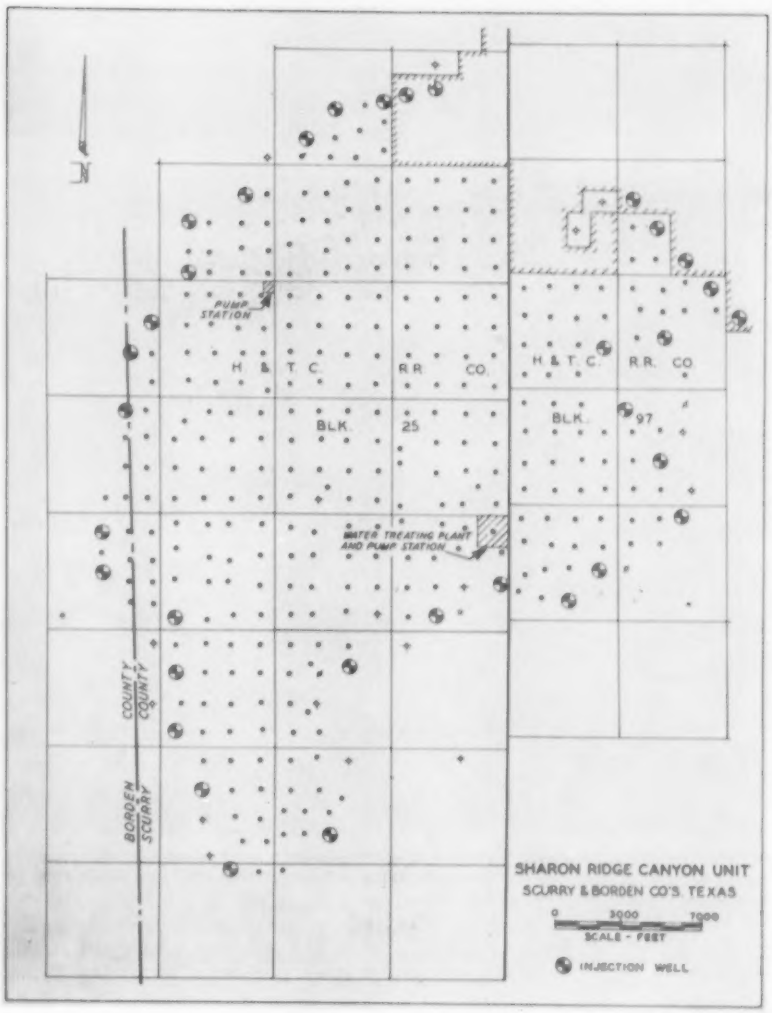
The application for unitization was approved by the Railroad Commission on February 14, 1955, and the effective date of unitization was set for May 1, 1955. In the meanwhile, bids were let for construction of the water-treating plant and pumping stations, and for the water-distribution systems. Actual construction commenced February 24, 1955, and was completed just prior to May 1. It is noteworthy that the construction was completed in an unusually short period of time.

Facility design . . . The facilities for pressure maintenance have been designed for anticipated future conditions. An engineering subcommittee carefully analyzed possible injection pressures and future withdrawals and recommended purchase of materials having a working pressure of 3,000 psi., and equipment capable of ultimately injecting 75,000 bbl. of water per day. In addition to being functional, the design includes flexibility and contains protective provisions against freezing.

Injection wells . . . Water injection was commenced on May 10, 1955. Twenty-eight wells producing from the Canyon Reef were initially converted to water injection. Other wells are scheduled for conversion, but the ultimate number of injection wells will depend upon the reservoir reaction to water. In order to determine the need for deepening injection wells, cores, drill-stem tests, radioactive logs, and permeability profiles before and after acidizing were obtained from six injection wells. It was found that the deepened sections of the reef communicate with the oil column. Reservoir pressures above the oil-water contact compare to pressures below the water contact and vertical permeability was found in the cores.

During the first month of operation, when water was being injected into wells which only partially penetrated the reef, it was learned that the low-pressure portions of the periphery would not take desired volumes of water at operating pressures. As a result of the information learned during the deepening of the first six wells and the experience gained in initial water injection, it was concluded that all injection wells require deepening. Deepened wells are readily taking water at low injection pressures.

On August 1, 1955, there were 343 wells participating in unit recovery. Twenty-eight of these were injection wells. About one-third of the wells were equipped to pump, and facilities are available for unit-wide pumping units.



Sharon Ridge operators unitize, start water injection, to

Double Oil Production

● Sharon Ridge Canyon operators in Scurry County, Texas, have unitized to implement pressure-maintenance operations designed to recover an estimated 115 per cent more oil from the Canyon Reef limestone than would be obtained under the usual natural production methods. Facilities are designed for an ultimate injection of 75,000 bbl. per day of treated lake water into limestone at a depth of 6,800 ft. and at a maximum pressure of 3,000 psi. Twenty-eight peripheral wells have been converted to water injection. Operators inject water directly into the oil column and also below the oil-water contact.

by T. M. Ocheltree, Warren Petroleum Corp.

SCURRY County, Texas, which spawned a great drilling boom during the period from 1948 to 1951, is well known for its tremendous reef reservoirs and huge oil reserves. Anticipated oil recovery from these reservoirs has always been high. And engineering studies subsequent to their development have shown that even greater oil recovery can be obtained from these reefs by supplementing the natural dissolved-gas drive with water injection and pressure maintenance.

Plans to augment recovery were commenced in the Sharon Ridge portion of Diamond "M" field shortly after preliminary development. The operators of Sharon Ridge have now accomplished unitization and have begun water injection for the mutual benefit of themselves, royalty owners, and the nation.

Location . . . The Sharon Ridge Canyon unit is located in the south portion of the continuous oil reservoir which includes the Diamond "M" and SACROC units. Sharon Ridge is largely in southwestern Scurry County and extends into southeastern Borden County. The reservoir is one of a series of reef fields in the Horseshoe atoll. Disconnected, but to the north, are Cogdell and Salt Creek fields. In a southwest direction is North Von Roeder field. These fields are all unitized for pressure maintenance.

Geology . . . The Horseshoe atoll is a buried ridge of low-relief, massive limestone. In the Sharon Ridge area the reef is terraced with a prominent dome in the southwestern end. The principal irregularities on the top of the reef are low mounds, basins, and channels. The productive area of Sharon Ridge is 13,873 acres, and the average thickness of the oil column is 96 ft.

In Sharon Ridge, production is found at a depth of about 6,800 ft. As much relief as 448 ft. of oil column above the oil-water contact is found in the highest structural well. The water table is irregular and tilted from southwest to northeast and dips about 55 ft. within the productive area.

Although cores are vugular and fractured, oil is primarily contained in secondarily formed pores. Correlation and tracing of porous zones are difficult and uncertain and there is little indication of uniformity in porosity and permeability. Shale lentiles usually occur as a local condition. An average porosity of 8.8 per cent has been determined from core analysis, and the average permeability is 43.9 md. Con-

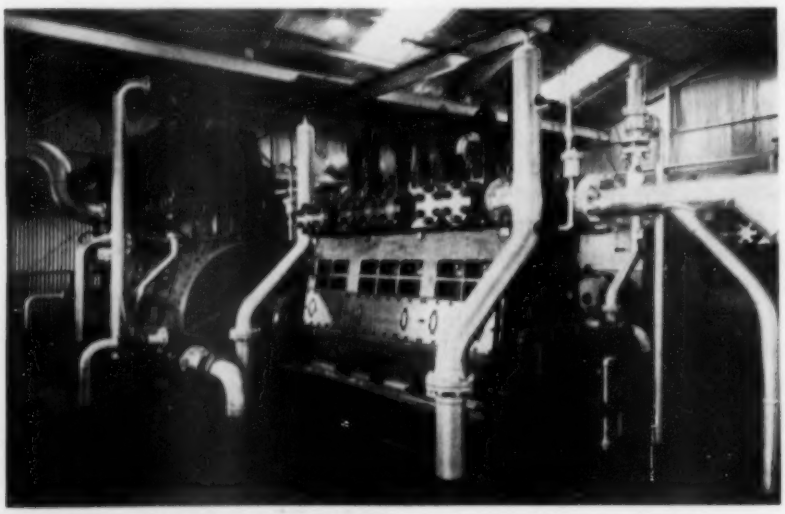
nate-water saturation is estimated to be 28 per cent.

Reservoir data . . . Saturation pressures from analyses of subsurface oil samples average 1,900 psi. Oil was undersaturated with gas at original conditions, and the dissolved gas-oil ratio was found to be 1,153 cu. ft. per bbl. of stock-tank oil at atmospheric pressure. The corresponding formation volume factor is 1.675. Oil viscosity at saturation pressure is 0.37 cp. The residual-oil saturation determined by flooding cores is about 25 per cent after flooding.

The main source of natural reservoir energy is the expansion of gas from solution. This is typical of the entire reef mass. The initial pressure in the field was 3,135 psi. at 4,300 ft. subsea and the reservoir temperature was 128° F. The average reservoir pressure on October 27, 1955, was 1,589 psi., and the cumulative oil production was 35,475,535 bbl. of stock-tank oil. This pressure is 1,546 psi. below original pressure and 311 psi. below saturation pressure. The decline in pressure indicates that the energy which produces oil is not being adequately replaced by natural means. Although some edge wells produce water, there is no evidence of an effective water drive.

Water injection . . . Fresh water purchased from the Colorado River Municipal Water District is received at the water-treating plant located in conjunction with the main pump station in the southeast portion of the unit. The location is in a central low topographic portion of the unit area to facilitate the possible gravity advantages of collecting produced water. Initial injection volumes now approximate 30,000 bbl. per day, but injection volumes gradually will be increased as additional injection wells are deepened. Current reservoir withdrawals can be balanced by the injection of about 35,000 bbl. of water per day.

WATER-TREATING facilities include filters, foreground; reactor, center; and chemical treating building in background. Three more filters will be added to the seven shown to bring the ultimate capacity to 75,000 bbl. per day.

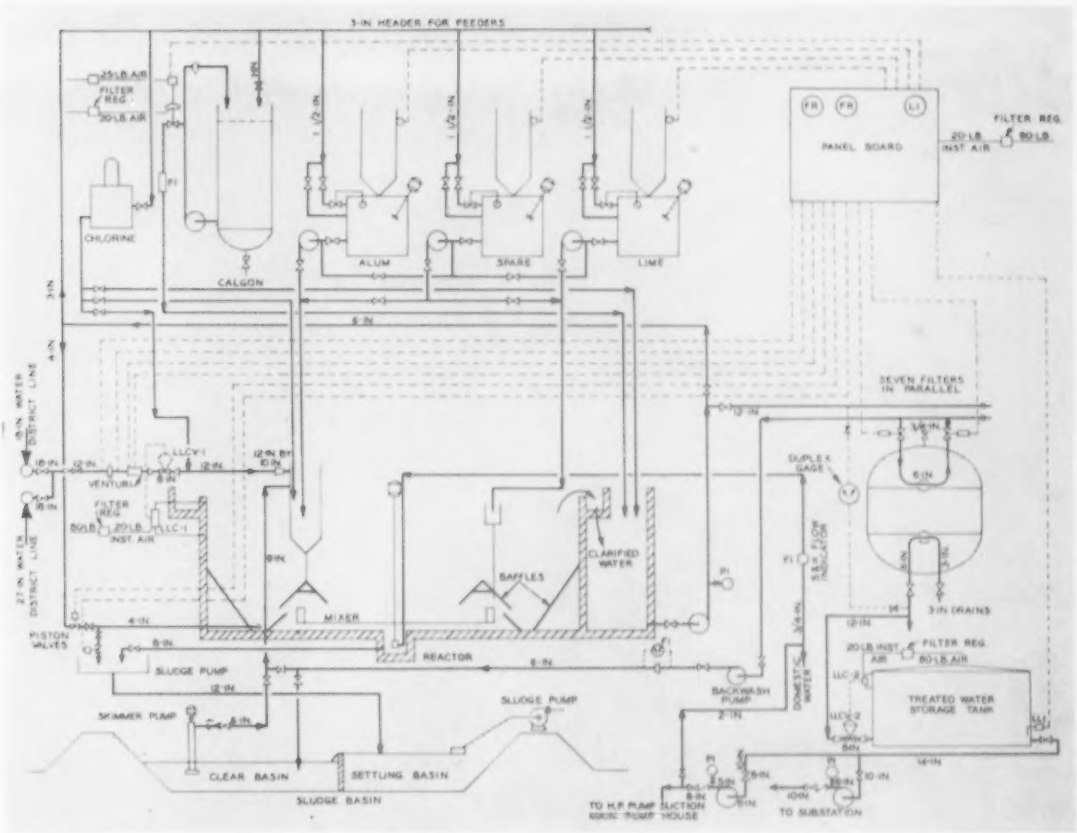


INJECTION PUMP and engine at the treating plant. Two high-pressure septuplex pumps are in operation in both of two pumping stations.

Treatment of water from the Colorado River is necessary to prevent the plugging of the formation. The water must be free of suspended solids, stabilized to be noncorrosive and nonscaling, and contain sufficient residual chlorine to insure against algae growth in the distribution lines and formation. Plugging of reef pores would result in increased operating pressures and could result in the loss of ultimate recovery by the isolation of contaminated zones.

Treating plant . . . Raw water from the Colorado River is measured in the water-treating plant, chemically treated in a solution-contact reactor, filtered, and stored in a surge tank to be available at the suction of the distribution system. The reactor removes most of the suspended solids by coagulation, and the filter battery completes the removal of turbidity.

The operation of the treatment process is controlled from a central panel board in the water-treating building. In the design of the plant, every effort has been made to utilize automation. The control board graphically shows the flow pattern of the entire water-treating area. Pilot lights indicate the



FLOW DIAGRAM of the water-treating plant. Water comes from the Colorado River and is stabilized to be noncorrosive and nonscaling and is treated to prevent algae growth.

operation of all feeders, motors, and valves. Push-button controls are provided for manual initiation of the counters and timers.

The reactor, located adjacent to the water-treating plant, is a 47-ft. diameter by 17-ft. high concrete tank containing baffles for hydraulically separating clarified water from coagulated solids. Alum and chlorine are added to the raw water ahead of the reactor to assure complete mixing of the chemicals and oxidation of organic matter. Lime is added in the reacting zone to provide necessary alkalinity for alum-floc formation.

Clarified water is drawn off the top of the reactor and chlorine and hexametaphosphate are added to the clarified water prior to its being pumped through the filters. These chemicals insure against algae contamination and scaling or corrosion in the system. Seven 10-ft. diameter pressure filters containing graded sand and gravel are in service and three additional filters will be installed to reach the ultimate design capacity of 75,000 bbl. of water per day.

Dual pump stations . . . Clarified water from the filters flows to the 5,000-bbl. surge tank and enters the main pump station, located adjacent to the treating facilities, for distribution to the high-pressure pumps in the main station and substation.

Two pump stations are cheaper than one. The choice was either to construct one station with four pumps or two stations with two pumps each. A study revealed that high-pressure lines radiating from a centrally located plant greatly exceeded the cost of two plants connected together by low-pressure piping. It was also concluded that greater flexibility could be achieved with two pump stations since it was anticipated that higher pressures would be found on the west periphery and the substation would be situated centrally and adjacent to the critical area.

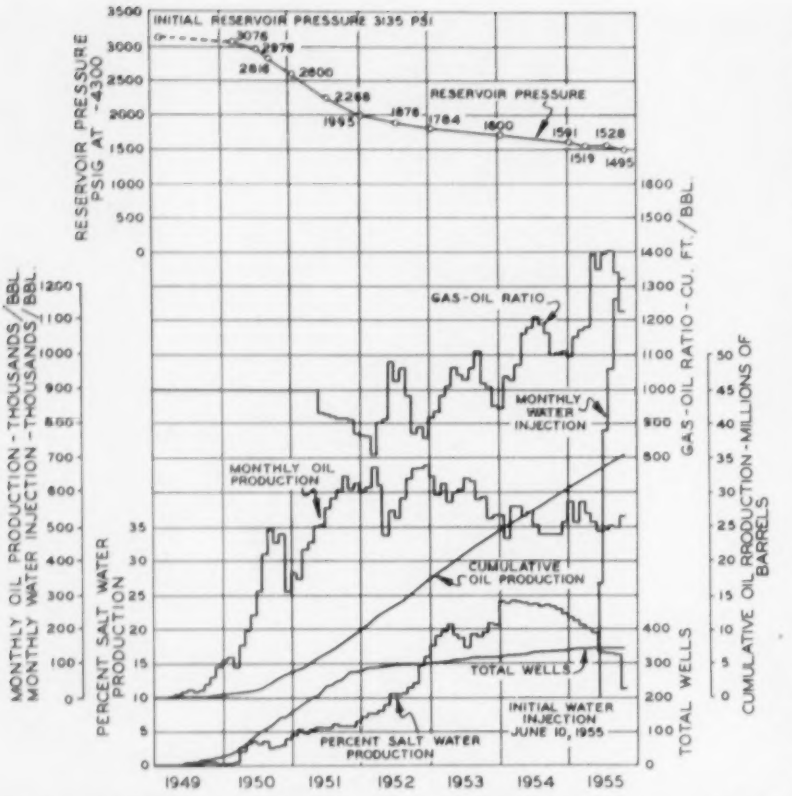
Likewise, the main-station site, dictated by low-elevation topography for gravity return of produced water, is ideally located for distribution of water to the south and east peripheries which are areas that will take water at lower pressures. Additional flexibility has been included in the design by looping the high-pressure distribution lines of the substation with the main-plant line providing injection water to the southern part of the unit. It is thus possible at this time to inject 31,100 bbl. of water per day at a pressure of 2,500 psi. to the entire distribution system from the main plant without operating the substation.

The two pump stations are identical except that a low-pressure double-suction 800-g.p.m. centrifugal pump is located in the main pump station adjacent to the water-treating plant for providing water to the substation. The low-pressure pump is powered by a 75-hp. induction motor.

Pumps . . . Both pump stations contain two 6-in.-stroke vertical septuplex sin-

THE AUTHOR

T. M. Ocheltree is chief petroleum engineer for Warren Petroleum Corp. He graduated from Pennsylvania State College in 1939 with a degree in petroleum engineering. He then went to work for Shell Oil Co., but left to spend 3½ years in the Air Corps during World War II. He then rejoined Shell and was an exploitation engineer in West Texas. He joined Warren in 1948 and has offices in Houston.



PRODUCTION HISTORY of the Sharon Ridge Canyon Unit. Reservoir oil was originally undersaturated but pressure has been drawn below the 1900 psi. saturation pressure causing an increased gas-oil ratio.

gle-acting plunger pumps. The pumps have feed lubrication and the suction and discharge manifolds are integral with the cylinders. The valves have individual covers for easy inspection and maintenance. The pumps in the main station are equipped with 3¼-in.-diameter plungers which operate at 300 r.p.m. to provide 15,500 bbl. of water per day at a discharge pressure of 2,500 psi. The two pumps in the substation are identical except that they have 3-in. plungers which displace 13,250 bbl. of water per day at 2,820 psi.

Pump capacity . . . The four pumps, with present plungers, have an output of 57,600 bbl. of water per day. If different injection volumes or pressures are needed, the stuffing boxes of the pumps are changeable so that different-size plungers may be installed.

The two pumps at the main plant are stainless-steel fitted for salt-water service. It will be possible in the future, therefore, to convert either pump to injection of produced water. If the plan is adopted, wells on the east periphery will be converted to salt-water injection.

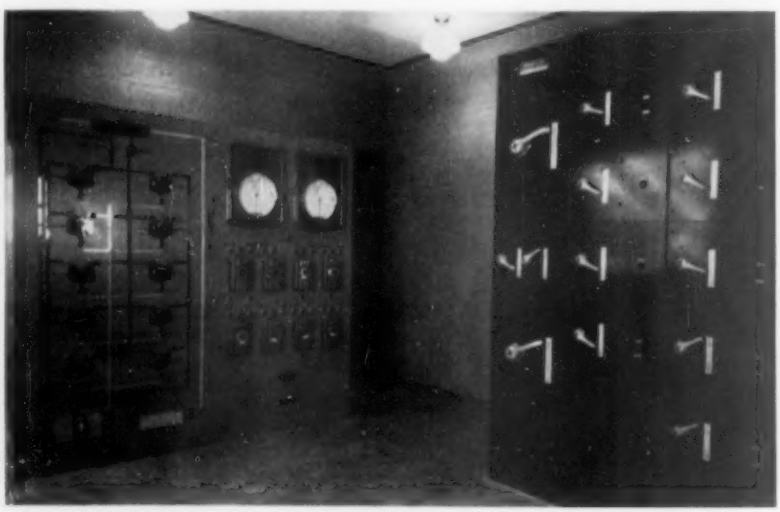
Engines . . . The four pumps are driven by six-cylinder, 16-in.-bore by 20-in.-stroke, vertical, four-cycle gas engines rated at 725 b.hp. at 300 r.p.m.

Shutoff controls . . . Engine speed is controlled by hydraulic governors at rates adjusted manually at each engine. In order to operate the plants with a minimum of personnel, as many engine pneumatic safety shutdown controls as possible have been added. The supply of fuel gas is shut off and the magnetos are grounded if the engine lube-oil pressure or jacket-water pressure fails, temperature becomes excessive, or if the main-pump discharge pressure becomes excessive. Also included are shutdown devices for engine overspeed, low main-pump suction pressure, and low main-pump lube-oil pressure.

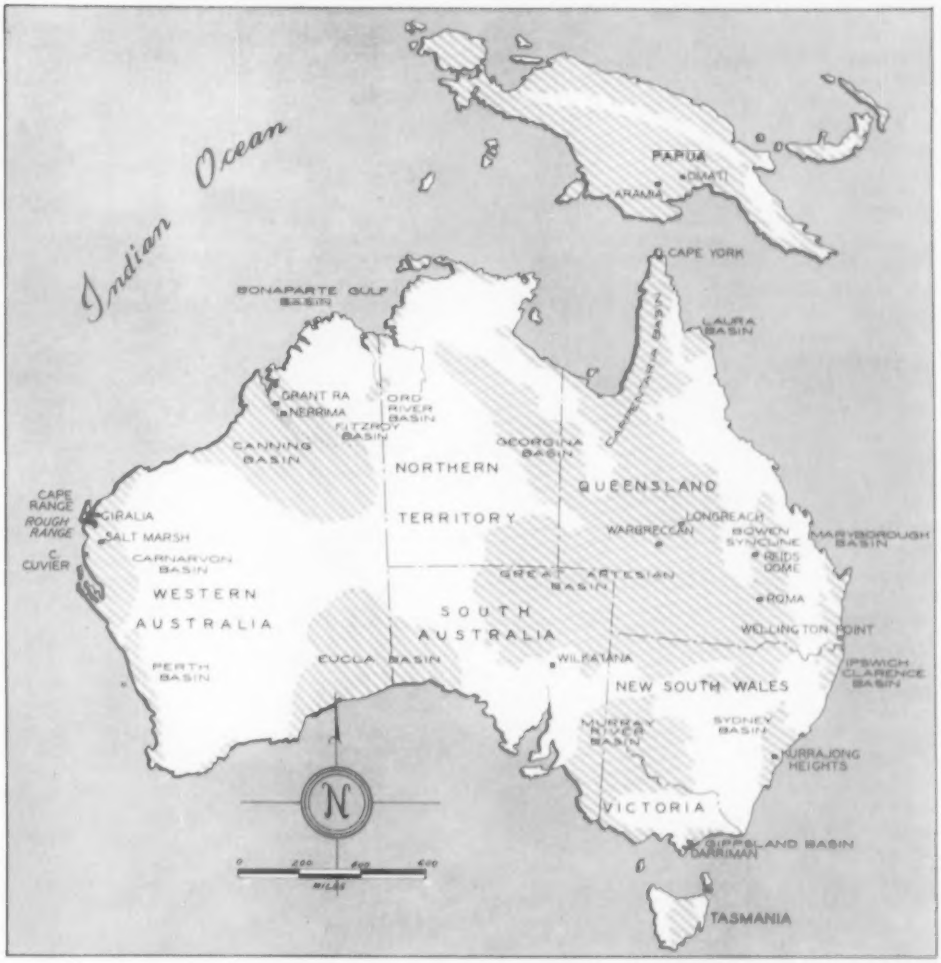
An unusual innovation in plant design is the cooling of engine jacket water and lubricating oil by shell-and-tube heat exchangers with injection water as the cooling medium. Pulsation due to high-pressure development in the pumps is a problem and pulsation dampeners minimize vibration.

Distribution system . . . The distribution system is composed of about 29 miles of pipe, and, other than the 10-in. low-pressure pipe connecting the two pump stations, is designed for a working pressure of 3,000 psi. High-pressure piping is sized from 8 to 3 in. for the ultimate injection of 75,000 bbl. of water per day. All pipe east of the main pump station is cement-lined for possible conversion of fresh-water injection to salt-water injection. The 10-in. low-pressure pipe likewise is cement-lined because the pipe is thin-walled and must last for the life of the flood. Throughout the system, insulated flanges are used to mitigate electrolytic corrosion. Provisions for internally scraping the pipe are provided.

At the time of unitization, two major operators had disposal systems for produced salt water in operation. In order to utilize all available water in the pressure-maintenance operation, the pipelines have been converted to closed systems for the injection of salt water into three selected injection wells.



CENTRAL CONTROL panels of the treating plant. Operation is automatic. Lights show operations in progress.



Australia has at least 10 sedimentary basins in which oil may occur. The island of Papua also has definite oil possibilities with both structures and potential reservoir beds.

Australia Still Looking for Second Field

Most states in the continent down under are involved in the intensive search to find another field. Some 33 wells have been completed in the past 20 months

by W. D. Mott

PRIOR to December 1953, the only Australian areas being explored were the Carnarvon basin; Western Australia; Papua; and Roma, Queensland.

Recovery of oil by drill-stem test from 3,605 ft. in 1 Rough Range in the Carnarvon basin set off an intensive search in most states.

A summary of wells drilled during 1954 and to September 1955 is presented with a brief description of the sedimentary areas being investigated or having prospect of attracting attention.

Author is a consulting geologist in Brisbane, Australia.

In all, 33 wells have been completed in the 20-month period resulting in 1 oil producer and 1 gas producer. Some others found traces of oil insufficient to recover by drill-stem test.

To correctly evaluate these figures it must be appreciated that little or no preliminary geological or geophysical work was done before drilling contracts were entered into by some companies and that these contracts called for a certain number of holes to be drilled or for a minimum contract period.

It is unfortunate that stratigraphic information cannot be given for all holes completed.

EXPLORATION

Papua-New Guinea

Search has been active in these territories since 1936. Most attention was paid to Tertiary rocks of arenaceous facies but recently interest has moved to limestone facies resting on Cretaceous in western Papua.

Aeromagnetic and surface geophysical methods indicate deep sedimentation in southwestern Papua.

Good structural conditions exist and

drilling prior to 1954 proved permeable formations at depth.

Activity in 1954 and 1955 consisted of extensive geophysical and geological exploration concurrent with a deep test at Omati. As a result of the exploration work the drilling program has been stepped up for late 1955 and 1956.

Bonaparte Gulf Basin

The continental portion of this basin consists of its southern, wedge-shaped margin. The trough of the basin is occupied by Joseph Bonaparte Gulf.

A considerable thickness of Paleozoic sediments is represented on the western margin while the eastern margin consists of Permian faulted against, or overlapping pre-Cambrian rocks.

Exposures on the western margin show 2,000 ft. of Cambrian and Lower Ordovician marine sediments resting on Lower Cambrian volcanics, 7,000 ft. of Upper Devonian sandstones and calcareous beds, 1,300 ft. of Carboniferous sandstones and limestones, followed by 2,000 ft. of Permian containing marine horizons.

Some or all of these sequences are expected to persist basinward beneath Upper Permian and younger deposits but their extent is not yet known. They offer good prospects of being both source and reservoir rocks.

Lack of exposures in the deeper parts of the basin prevents determination of structure and gravity surveys are in progress to provide information.

No deep drilling has yet been undertaken in the area.

Fitzroy and Canning Basins

This basin, formerly known as Desert basin, consists of Paleozoic and Mesozoic sediments filling a depressed area in pre-Cambrian. The Fenton fault separates the Fitzroy basin from the Canning basin.

Marine Ordovician and Devonian Sediments crop out along the northern margin of the basin and are overlapped by Permian sediments of glacial origin or derivation which pass upward into marine sediments. Mesozoic rocks are present in marine facies.

Showings of oil were found in the Ordovician sediments in 1922 and the potentialities of the area depend on the distribution of these and the Devonian rocks basinward.

Structure in the Fitzroy basin consists of lines of closed anticlines arranged en echelon and trending at an angle to the Fenton fault. All folds close in Permian rocks.

Recent drilling has proved that Carboniferous sediments occur in the basin at a depth of 6,000 ft. and wedge out toward the margins. This places the older rocks at depths greater than anticipated.

TABLE 1—EXPLORATION IN PAPUA-NEW GUINEA

Company and well—	Total depth (ft.)	Comp.	Top of formations* (ft.)	Remarks
Island Exploration Co.:				
1 Omati	14,352	Apr. '55	Tertiary Cretaceous 10,065	Petroliferous gas 13,740 ft., small volume.
2 Omati	10,880	July '55	Tertiary Cretaceous	
1 Aramia	5,516, in progress		Tertiary	

*Throughout these tables, all available tops of formations are shown in feet; where no footage was available, names of formations penetrated are given without figures.

TABLE 2—EXPLORATION IN FITZROY AND CANNING BASINS

Company and well—	Total depth (ft.)	Comp.	Top of formations (ft.)	Remarks:
Western Australian Petroleum Co.:				
1 Grant Range	12,056, in progress		Permian Carboniferous 4,900 Devonian (?)	Small gas showing 6,000 ft.
Associated Freney Oilfields N.L.:				
1 Nerrima	9,072	Aug. '55	Permian Carboniferous 6,450	Four thin oil-impregnated sands, 2,675-2,840 ft.

TABLE 3—EXPLORATION IN CARNARVON BASIN

Company and well—	Total depth (ft.)	Comp.	Top of formation (ft.)	Remarks
Western Australian Petroleum Co.:				
1 Rough Range	14,602	Jan. '54	Tertiary Cretaceous 900 Jurassic 3,620 Permian 6,240 Carbo-Devonian(?) 10,700	Oil sand 3,605-20 ft. Initial 25-hour test, 550 bbl. Traces oil and gas 9,789-10,547 ft.
2 Rough Range	4,079	1954		Terminated in Jurassic.
3 Rough Range	3,915	1954		Terminated in Jurassic.
4 Rough Range	3,740	1954		Terminated in Jurassic.
5 Rough Range	3,780	1954		Terminated in Jurassic.
6 Rough Range	3,658	1955		Terminated in Jurassic.
7 Rough Range	4,281	Feb. '55		Terminated in Jurassic.
8 Rough Range	3,861	Mar. '55		Terminated in Jurassic.
1 Cape Range	8,019	1954	Tertiary Cretaceous (?) Jurassic 3,585	Gas shows in Jurassic.
2 Cape Range	10,693, in progress			Drilling in Jurassic. Gas showings in siltstones below 6,800 ft.
Salt Marsh area:				
1 Waroora	5,095 (May '55)			
1 Grierson	1,400	May '55		Stratigraphic tests.
2 Grierson	1,500	June '55		Stratigraphic tests.
3 Grierson	1,270	June '55		Stratigraphic tests.
1 Giralia	4,087	July '55	Cretaceous Permian	
1 Cape Cuvier	1,500	Aug. '55		Structure hole.

No details of structure or basement depth are available south of the Fenton fault.

Carnarvon Basin

This was formerly called North West basin. Marine Devonian and Carboniferous rocks are exposed on the central eastern margin of this area, overlain westward by Permian, Cretaceous, and Tertiary sediments with extensive Quaternary cover. The western margin of the basin is to seaward.

The Paleozoic rocks are folded and strike faulted while nearer the coast the Tertiary and Mesozoic formations are folded into domes and anticlines which have marked topographic expression.

Investigations have been made by the Bureau of Mineral Resources (Commonwealth Government organization) and Western Australian Petroleum Co. They resulted in the deduction that beneath the Tertiary structures in the Exmouth Gulf area the Cretaceous-Permian unconformity would give rise to conditions most favorable for testing the possibilities of the Permian rocks. Also, there were prospects of finding the Devonian and Carboniferous rocks at reasonable depth.

The 1 Rough Range test flowed oil

at 3,605 ft. in the basal Cretaceous Birdrong sandstone. It then penetrated Jurassic sediments, previously unknown in this basin, before entering Lower Paleozoic rocks.

Seven subsequent holes on Rough Range anticline failed to find the Birdrong sandstone at a structural position favorable to accumulation. Thickness variations had more effect than tectonic folding.

Two holes drilled on Cape Range anticline to the west of Rough Range have proved thickening of the Jurassic in that direction.

A program of stratigraphic holes on Rough Range and other structures in the area is in progress together with geophysical investigations.

In order to conduct a materials-balance test on the oil accumulation it was necessary to drill a substitute well, 1-A Rough Range, 30 ft. from No. 1 because of cementing up of the original production zone. After a series of tests in which 16,896 bbl. of oil and 3,689 bbl. of water were produced, the company announced that no definite conclusions as to the size or potentialities of the reservoir could be reached. The oil is low gravity without gas.

Gippsland Basin

A small amount of heavy oil has been obtained from glauconitic sand with 10-20 per cent porosity at 1,200-ft. depth. The oil overlies artesian water and is usually produced as an emulsion. Cumulative production since 1930 is of the order of 3,000 bbl.

The glauconitic sand is of Lower Miocene age and is petroliferous where it rests on Paleozoic rocks. Where the Tertiary beds rest on Mesozoic sediments no oil is found.

A recent interpretation of the area points to the possibility that the source of the oil is in Upper Paleozoic or Mesozoic rocks and accumulation has taken place by updip migration beyond the Mesozoic pinchout.

Mesozoic, Tertiary, and Recent deposition has overlapped landward (northerly) on basement consisting of Lower and Upper Paleozoic. Structure in the basement is complex and divergent from that in younger rocks. Exploration has to contend with discordant structural trends as well as disconformity.

Ipswich-Clarence Basin

This basin is of the intramountain type and was filled during Mesozoic times.

The margins show Permian and Lower Paleozoic rocks dipping basinward. They are generally marine but have suffered varying degrees of metamorphism. The Mesozoic sequence of volcanics, sandstones and coal measures providing the source of south Queensland coal.

TABLE 4—EXPLORATION IN GIPPSLAND BASIN

Company and well—	Total depth (ft.)	Comp.	Top of formation (ft.)	Remarks
Frome Lakes Pty., Ltd.:				
1 Darriman	3,062, in progress		Tertiary	

TABLE 5—EXPLORATION IN SYDNEY BASIN

Company and well—	Total depth (ft.)	Comp.	Top of formation (ft.)	Remarks
Aust. Oil & Gas Corp., Ltd.:				
1 Kurrajong Heights	4,700 Temp. suspended		Triassic Permian	Low-pressure gas at 2,000 ft.

TABLE 6—EXPLORATION IN MARYBOROUGH BASIN

Company and well—	Total depth (ft.)	Comp.	Top of formation (ft.)	Remarks
Lucky Strike Oil Co.:				
1 Cherwell Creek	9,773	Mar. '55	Cretaceous	
Susan Creek	8,169	July '55	Cretaceous	
Winneill Pty., Ltd.:				
Wellington Point	3,751	Aug. '55	Tertiary Basalt Triassic (?) 797 Metamorphic 3,699	

TABLE 7—EXPLORATION IN BOWEN SYNCLINE

Company and well—	Total depth (ft.)	Comp.	Top of formation (ft.)	Remarks
Australian Oil Exploration, Ltd.:				
1 Reid's Dome	9,060	Mar. '55	Middle and Lower Permian Metamorphosed Lower Permian 8,020	480-2,716 ft. gas and oil showings. 7,739 ft. oil showing in fractured shale.
2 Reid's Dome	4,037	July '55	Middle and Lower Permian Igneous intrusives (?)	

TABLE 8—EXPLORATION IN GREAT ARTESIAN BASIN

Company and well—	Total depth (ft.)	Comp.	Top of formation (ft.)	Remarks
Associated Australian Oilfields N.L.:				
4 Roma	3,882	July '54	Lower Cretaceous Jurassic 490 Triassic 2,675 Basement 3,882	3,700 ft.: Gas sand tested 1¼ M.M.c.f. per day. Petroliferous.
5 Roma	4,079	Jan. '55	Lower Cretaceous Jurassic 505 Triassic 2,700 Basement 4,070	Traces gas and oil. Hole down structure.
6 Roma	4,285	Aug. '55	Jurassic Triassic 2,710 Basement 4,209	Traces gas and oil. Hole down structure.
Longreach Oil, Ltd.:				
1 L.O.L.	3,068	Jan. '55	Lower Cretaceous Jurassic 2,284 Granite 3,056	
2 L.O.L.	3,224	Mar. '55	Jurassic 2,445 Granite 3,219	
3 L.O.L.	3,490	Apr. '55	Jurassic 2,545 Granite 3,405	
4 L.O.L.	3,277	May '55	Jurassic 2,460 Granite 3,275	Oil impregnated tight sand 3,215 and 3,243 ft.
Westland Oil Co.:				
1 Warbreccan	5,433	Apr. '55	Cretaceous Jura.-Trias. 2,900 Carboniferous? 5,200? Granite 5,432	
2 Warbreccan	5,224	June '55	Similar to 1	Did not reach basement.
3 Warbreccan	6,054	Aug. '55	Mesozoic Carboniferous 5,320?	5,112 ft. oil showing in porous sand.
SANTOS:				
1 Wilkatana	320, in progress		Tertiary	Stratigraphic test—Pirie-Torrens basin.

Surface structure exists in the Mesozoics with some faulting.

A well is scheduled on the southern nose of a long structure which has been mapped in places. No geophysical investigation has been made. The well is located to evaluate a showing of petroliferous gas in a deep water bore.

Sydney Basin

This Triassic-filled basin trends northwesterly immediately west of Sydney. Permian rocks, consisting of coal measures with two marine sequences more than 1,000 ft. in thickness, are exposed to the north and south of Sydney and underlie the Triassic rocks. Older Paleozoic rocks metamorphosed to varying degree crop out on the outer margins of the basin.

The Permian sequence consists of some 2,000 ft. to 3,000 ft. of upper Coal Measures 2,000 ft. to 5,000 ft. of upper Marine shales with glacial pebbles, 200 ft. to 500 ft. of Greta Coal Measures and 1,000 ft. to 4,800 ft. of lower Marine sediments with glacial erratics and volcanic ash and flows.

Closed structures exist within the Triassic and Permian areas, the largest one exposing Carboniferous in its crest. Permian formations have suffered more deformation than the Triassic.

Several test wells have been drilled in the basin, some finding methane gas, without traces of petroleum. Pre-Permian beds have not been reached by any well.

The area is currently being drilled and investigated by surface mapping, gravity survey and aeromagnetic survey.

Bowen Syncline

This basin is situated between the coastal ranges and the Central Queensland Highlands consisting of Paleozoic upfolds. The trough plunges south beneath the southeast lobe of the Artesian basin and may be related to the Sydney basin.

Marine Middle and Lower Permian, with volcanic activity at the base, dip troughward under Upper Permian sediments with Coal Measures and Triassic rock occupying the trough. Facies change to continental sediments takes place on the western margin.

The eastern limb of the syncline shows little folding but the broad western limb shows compression folds increasing in intensity westward with fold crests becoming more deeply exposed. Tertiary basalts are present over much of the western limb.

The area has attracted attention because the marine sequence contains likely reservoir rocks and presence of closed structure is highly probable. A well drilled in 1939 met petroliferous gas in the upper part of the marine section. Drilling at Reid's Dome commenced low down in the marine section and met shows of gas and oil. As yet no recent well has been located to penetrate the entire marine sequence.

Some gravity work has been done on the east limb and in the south to trace the extension beneath the overlapping Mesozoics.

Maryborough Basin

Two wells have been drilled in this basin to 9,773 ft. and 8,169 ft., respectively. They penetrated thick marine Cretaceous shales and sandstones with little porosity and terminated in Lower Cretaceous fresh-water volcanic sediments.

The western margin of the basin exposes Cretaceous, Jurassic, Triassic, and metamorphosed Permian rocks. There is evidence of igneous intrusion of the older marginal Mesozoics. North-trending structures exist in the area and persist seaward. The eastern limit of the basin is below sea level. Drilling has demonstrated thickening eastward and it would require offshore investigation to determine further details.

The area was considered likely to offer marine Jurassic facies but these rocks are likely to be at considerable depth.

Wellington Point well was drilled in what may be an extension of the Maryborough basin. Tertiary basalt, Lower Triassic (?) sandstones and Lower Paleozoic metamorphics were penetrated. Basement was reached at 3,699 ft.

Great Artesian Basin

As delineated this basin covers the Mesozoic artesian area. The floor of the basin has not been explored in any detail. It will certainly be subdivided when more information becomes available.

The deepest portion of the basin is probably south of the northeast corner of South Australia. A gravity survey estimated 8,000 ft. to pre-Mesozoic rocks and extrapolation of form lines suggests 6,000 ft. The topmost aquifer (Lower Cretaceous) offers a correlation horizon in water bores and, together with bores which have reached the floor, indicates that the trough trends northeastward and that a ridge extends southwestward separating it from the southeast lobe of the basin. Jurassic and Triassic rocks are present but their distribution is not well known. The structure is very gentle.

Marine Permian rocks of the Bowen syncline are overlapped by the Mesozoics and Upper Permian dips beneath the east-central margin of the Mesozoics. Marine Cambrian and Ordovician rocks are overlapped on the northwest margin. The southern and western margins lap onto Paleozoic or older rocks.

Several water bores show gas and petroleum in trace amounts. Recent drilling at Longreach showed heavy oil impregnation of Jurassic sandstone near granite and at Warbreccan a thin Jurassic (?) quartz sand showed light oil impregnation above an unconformity with Carboniferous (?) shale and sandstone.

At Roma in the southern lobe of the basin gas-bearing and oil-impregnated Triassic sands rest on granite and indurated, tilted shales.

Gravity surveys have been undertaken east of Roma and Longreach and an aeromagnetic survey flown northwest from Roma. The southwestern margin of the basin is being investigated. A stratigraphic hole is in progress in Tertiary rocks with oil showings at shallow depth. This well is beyond the Artesian basin in the Pirie-Torrens basin of South Australia.

Carpentaria Basin

A pre-Cretaceous ridge separates this basin from the Great Artesian basin. Recent investigations in western Papua indicate deep sedimentation around the extension of Cape York Peninsula and it is possible that this basin is an embayment off that depression.

The southern and eastern margins of the basin show Cretaceous and Jurassic (?) marine sediments dipping basinward and resting on Lower Paleozoic and older rocks. On the western margin Cretaceous overlaps and may be faulted against pre-Cambrian.

Exploration is designed to search for Mesozoic deeps and possible Tertiary development basinward. Aeromagnetic reconnaissance has been conducted and gravity and scout drilling is planned.

Ord River Basin

This basin, some 2,200 sq. miles in area, trending southwesterly, consists of 3,000 ft. of Cambrian sandstones, shales, and limestones occupying a depression in Lower Cambrian volcanics a few thousand feet thick which may in turn rest on unmetamorphosed upper Proterozoic rocks.

An anticlinal nose trending northwesterly into the basin has an interesting occurrence of asphalt in vesicular basalt considered to have originated in the overlying, but since eroded, Cambrian sediments. No current exploration is under way.

Murray River Basin

Although this basin extends inland a considerable distance it is probably only the coastal strip which is potentially interesting.

Some 10,000 ft. of Tertiary sediments overlie fresh-water Jurassic beds on the coast but inland only 1,000 ft. is present resting on basement.

Fig. 1—Air or gas drilling is extremely effective in reducing lost circulation in the Rocky Mountains.

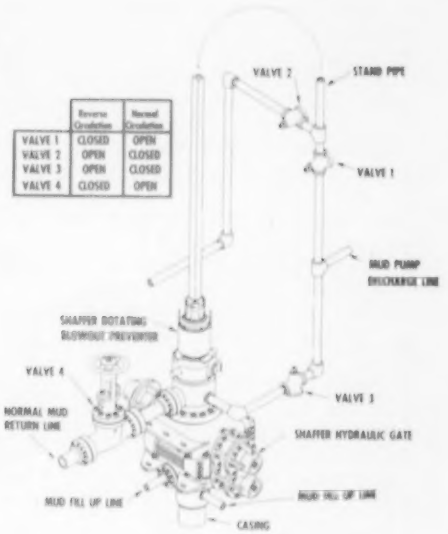


Fig. 2—Here is a typical hookup for using either reverse circulation or normal circulation during air drilling operations.

Air-Gas Drilling Is Faster and Cheaper

by Fred R. Nelson* and Norman S. Morrisey†

AIR and gas drilling can reduce drilling costs 75 per cent under favorable conditions. Continental Oil Co. cut $25,000 mud bills to zero and drilling time from a high of 19 days on mud-drilled holes to 2½ days on air-drilled holes in South Little Buck Creek field of Wyoming. Conoco's drilling in the Raton basin of New Mexico proved that air or gas drilling can be a definite money saver, cutting total drilling costs from about $40 per foot to less than $10.

Conditions that favor air or gas drilling in the Rocky Mountains are:

1. Formations suitable for drilling easily such as shales or shales and poorly cemented sands or sandy shales.

2. Formations that do not contain sands or limes that contain or will produce water in excessive amounts.

3. Drilling formations that are consolidated so the well bore will not slough or cave (that is loosely consolidated sands and shales often cannot be drilled with air).

South Little Buck Creek

Production at South Little Buck Creek is from the Dakota sandstone at about 4,100 ft. The field lies in Niobrara County, eastern Wyoming. Severe lost-circulation trouble occurs in the Niobrara shale in the interval 1,200 to 3,000 ft. Mud bills on some wells have exceeded $30,000 and, of course, the rig time lost has contributed to make these wells expensive.

Continental planned to drill a new well at South Little Buck Creek in May 1955. The last field well, drilled in 1954 had run into severe loss of circulation that cost $25,000 in mud alone; and the contractor needed 25 days to drill the 4,007-ft. hole.

Recent experience with air drilling in the Raton basin had been highly successful (Table 2) in cutting well costs. For this reason, Continental set up an air test at South Little Buck Creek. Well Completions, Inc., of Denver, furnished the two compressor units. These units are designed especially for oil-well air drilling and are rated at 750 cu. ft. per minute each at 275 psi. and 5,000-ft. elevation. The two compressors were diesel-powered, completely unitized with cooling and fuel tanks and mounted on lo-boy trailers for mobility.

Drilling . . . The 20-in. surface hole was drilled with mud to 92 ft. and 81 ft. of 16-in. conductor pipe run. After the cement had set on the surface pipe, the shoe was drilled with mud and then the hole was dried up with air. Contractor drilled with air from 92 ft. to total depth of 3,889 ft. using only one 9-in. bit. This bit was not pulled until total depth and was in excellent condition at the end of the run. The contractor used 4½-in. drill pipe with a circulation rate of 1,800 cu. ft. of air per minute. No problems occurred while drilling with air. The oil string, 7⅝-in. casing, was set on bottom and the hole was in gage, judging from the ease experienced in setting the pipe.

Is air drilling profitable? . . . A study of Table 1 shows that the answer is "Yes, definitely, if conditions are favorable." The cost of drilling with mud on two field wells is compared to the cost of two air-drilled holes. The cost of the conventional holes is figured on both a footage basis and on a day rate. The 2 McGuire was drilled using mud on a contract paying footage rates of $7.50 per foot and drilling costs were $21,358. On a day-rate basis of $725 per day, the well would have cost $8,433. The air-drilled holes, by the way, cost $725 per day on a contract

*Regional drilling superintendent, Continental Oil Co., Denver, and †drilling-development editor, The Oil and Gas Journal.

basis. Continental had severe lost circulation on the 1 Government and the well actually cost $58,827 with a footage rate of $7.50 per foot. If these figures are converted to a day-rate basis, the well would cost $43,954.

Total drilling costs on the 2 Government, first air-drilled hole at South Little Buck Creek, were less than $4,300! This is $17,000 less than the drilling costs on the 2 McGuire and $54,598 less than the drilling costs on the 1 McGuire. Actual drilling time on bottom for the 2 Government was 50 hours, and oil production was encountered.

Heartened by success with air drilling, Conoco drilled the 3 Government and the drilling results were again highly favorable. On the second air test, operator found water in the Dakota and plugged the well.

Raton Basin Air Drilling

The Raton basin is a relatively unexplored sedimentary basin lying partially in North Central New Mexico and South Central Colorado. The sediments encountered are very similar to those found in the San Juan basin and northward in the southern portion of the Denver basin along the Las Animas arch. The formation names are somewhat different, but their description is very similar. Table 3 is a geological section from the south and north portions of the basin.

Wells that were drilled in the southern portion of the basin commenced in the geological section just above the Dakota series. These wells could be drilled with gel and water as no serious loss-of-circulation troubles were encountered. From the Santa Rosa formation on down to granite, the zones or beds of shales, sandstones, and limestones are extremely hard and tight. The Glorietta sandstone is a marine deposit and has possibilities of a reservoir if suitable porosity and permeability were found. The Magdalena has interfingering sands and limes with the lime being marine and presents a possible stratigraphic accumulation in porous zones.

In the northern section of the basin, wells commenced drilling in the Pierre shale. The Apishapa shales, Timpas shales, Carlile shales, and Green Horn shales and limes follow in that order below. Severe lost-circulation troubles have been found in these shales, particularly in the Pierre and Apishapa. These shales, fractured to some extent, have definite bedding planes which are lines of weakness. In drilling with gel and water, the hydrostatic column is sufficient to overcome these fractures or weaknesses and the formations or zones are easily fractured. Definite indications are that fracturing occurs with excessive pump pressure and when running in with drill pipe. The formations from the Dakota on down are quite hard and difficult to drill; the Glorietta and Sangre de Cristo formations are rough to drill.

The first wells in the north section of the basin were drilled with conventional rotary tools and gel and water. Due to the extremely difficult lost-circulation troubles mentioned previously, the cost of drilling these wells was excessive. Lost-circulation material, drilling mud, and cementing operations were the chief causes of this excessive drilling cost. Success with air drilling of similar formation in the San Juan basin had been reported, and the company reviewed these operations carefully. It was decided to drill a Dakota sand test with air.

The first well was commenced with mud, and after surface pipe was set, air compressors and attendant drill equipment were rigged up. The formations to the top of the Dakota were drilled very quickly, and no hole caving or other trouble was encountered until the Dakota sand was reached where water came in with sufficient quantity to prevent further drilling with air. A protection string was set at this point, and the Dakota sands were cored with conventional mud and rotary tools. In this well, and in another well drilled with air, the first Dakota sands were hard and impermeable. The shale gave some difficulty in that core recovery was drilled to powder.

TABLE 1—DRILLING COST COMPARISONS—DRILLING BELOW SURFACE PIPE ON FOUR WELLS—SOUTH LITTLE BUCK CREEK—NIOBARA COUNTY, WYOMING

Well—	2 McGuire		1 Govt.		2 Govt.	3 Govt.
	Footage basis	Day basis	Footage basis	Day basis	Day basis	Day basis
Total depth, ft.	4,030	4,030	4,007	4,007	3,889	4,250
Days below surface pipe	6.69	6.69	19.4	19.4	2.37	2.6
Size bit, in.	8¾	8¾	9	9	9	9⅞
Number of bits	6	6	8	8	1	2
Feet per bit	675	675	501	501	3,807	2,075
Water and mud cost	$2,125	$2,125	$27,175	$27,175	0	0
Air cost					$1,161	$1,750
Total drilling cost on compared basis	$21,358	$8,433	$58,827	$43,954	$4,228.55	*$5,000

*Estimated.

TABLE 2—DRILLING COSTS OF FIVE WELLS PRORATED TO 3,000 FT., RATON BASIN, COLFAX COUNTY, NEW MEXICO

Well No.—	2	3	5	6	1
Surface pipe (o.d. in inches, casing point in feet)	13⅜ at 293	13⅜ at 534	10¾ at 229	10¾ at 508	10¾ at 294
					Core 2,794
Total days to 3,000-ft. depth	16	24	27	5	4
Total bits below surface to 3,000-ft. depth	11	14	16	2	2
Feet per bit	272	224	187	1,500	*1,500
Total depth of hole (ft.)	7,257	5,491	2,880	3,050	2,900
Mud costs, prorated for 3,000	$20,000	$8,800	$15,600	0	0
Air costs	0	0	0	$2,655	$2,655
Total cost of mud for well	$47,515	$16,153	$14,800		0
Total cost of well, incl. testing, coring, etc.	$280,000	$160,000	$72,249	$32,100	$29,400
Est. cost of first 3,000 ft. of hole	$116,000	$87,400	$75,200	$31,500	$30,400

*Estimated.

Locations: 2—SW SW 26-31n-21e. 3—NE NW 18-30n-21e. 5—NW SW 16-29n-22e. 6—SE SE 26-31n-22e.

TABLE 3—RATON BASIN STRATIGRAPHY

Geological Section—Southern Portion

Graneros—Shales with streaks of limestone
Dakota—Good sandstones with shale streaks
Morrison—Good porous sandstones with shales, mostly shale
Entrada—Hard tight sandstone
Chinle—Red to brown shales with siltstones
Santa Rosa—Green to brown shales with shaly sands
Glorietta—Hard quartzitic sand very tight with secondary quartz
Yeso—Tight silty sand
Sangre de Cristo—Shales, sandstones, and limestone interbedded
Magdalena—Sandstones and limestone, hard and tight
Pre-Cambrian—Sandstone and granite

Geological Section—North and Central Portion

Pierre—Dark gray shales
Apishapa—Shales
Timpas—Shales with shaly limestones
Carlile—Dark gray shales
Greenhorn—Limestone with thin shales
Graneros—Black shales
Dakota—Very hard conglomerate sandstone with thin shales
Morrison—Green to brown shale with sandstones
Todilto—Anhydrite limes, gray shales
Entrada—Sandstone
Chinle—Gray to red shales with siltstone
San Andreas—Siltstone with shales
Glorietta—Fine hard tight quartzitic sandstone
Sangre de Cristo—Shales and red siltstones
Madera—Red siltstones and black shales
Intrusives—Granites

Conoco has recently drilled another Dakota test in its 7 St. Louis Rocky Mountain, using air to drill the shale sections above the Dakota. Also, a protection string was set before coring the Dakota sands. These were, incidentally, hard and dense in parts of the Dakota section. These Dakota sands present somewhat of a stratigraphic possibility because there are a number of sand sections within the series; and it is thought these are sand lenses rather than continuous sands over a broad area. Wells have found some oil saturation and staining within these sands below water-bearing sections.

Drilling costs . . . Prior to the South Little Buck Creek tests, Conoco had drilled a couple of wells in the Raton basin with air. Three previous wells in the basin had excessive mud bills (Table 2) ranging from $8,800 to $20,000 on the first 3,000 ft. of hole.

Severe lost circulation was the reason for excessive mud bills. This occurred in the first 3,000 ft. of hole in the Pierre and Timpas shales. These formations contain fractured zones or zones with weak bedding planes; continuous lost circulation with mud was found which required cement plugs to finally seal off the zones before a protection string of 9⅝-in. casing was set.

Drilling costs on these first wells prorated to 3,000 ft. ranged from a low of $75,200 to a high of $116,000. Savings on the two air-drilled holes amounted to nearly $45,000 per well compared to the cheapest mud-drilled hole. On top of that, the contractor drilled the air holes in only 4-5 days compared to 16 days to reach 3,000 ft. on the fastest mud-drilled hole.

A comparison of drilling costs using mud, lost-circulation material, etc., approaches $40 per foot, whereas air drilling cut this cost to below $10. These costs are over-all figures from preparing location to moving the rig out. This explains why Conoco is using air drilling if at all possible in this basin.

Air-drilling results . . . Continental's experience emphasizes that air drilling is a very inexpensive method of drilling when conditions are favorable. Bit performance on the air-drilled holes was from four to eight times better than on the fluid-drilled holes. At South Little Buck Creek, holes drilled with mud required an average of 7½ bits per well; the air-drilled holes needed only 1½ bits per well. This is a savings on bit costs alone of over $900 per well. More important, however, in the results cited are the savings in mud bills—as much as $27,175 where lost circulation was extreme.

Continental's experience with air drilling proves conclusively that where conditions are favorable:

1. Bit costs are appreciably lowered.
2. Penetration rates are faster (up to seven times).
3. Excessive mud costs are reduced to zero.
4. Total drilling costs are cut at least 50 per cent, even if lost circulation is no problem.

Cost of air drilling . . . Equipment for air drilling, like all drilling equipment, is expensive. Large compressor units seem to offer the most economical means to drill with air. And most air-drilling operations require two compressors and occasionally three. In addition the rig must have standard pumps to handle mud in case of a possible blowout or water that air drilling cannot overcome. The wellhead hookup is fairly simple and inexpensive (Fig. 2) and normal drilling operations can be converted quickly to air drilling in most instances by the addition of a rotating blowout preventer and an extended flow line.

Because of the high cost of this specialized drilling equipment, many contractors and oil companies prefer to rent the compressors and other necessary equipment. It costs about $175 per day to rent a compressor capable of delivery 1,050 cu. ft. of air per minute at a terminal pressure of 275 psi. Air drilling in the Rocky Mountains normally requires two compressors; $95 per day is charged for two or three men depending on the number of units being rented. Thus, two units would rent for $445 per day with minimum charge of 5 days' rental or a minimum charge of $2,225. In addition, mileage is charged at 50 cents per mile per unit which often amounts to $300 to $400 as they are based in Denver. The average charge per air-drilling operation has been $2,500, based on Continental's experience, or about $500 per day.

This figure includes all fuel, maintenance, and repair costs as well as the cost of supervisory personnel for the air drilling. At first glance, the $500 per day appears unduly high but the equipment can bring a savings of as much as $20,000 in mud bills.

Air drilling (for contractors) . . . But let's reanalyze the figures on the 3 Government at South Little Buck Creek (Table 1). This field well was originally drilled on a day-rate basis of $750 per day; contract footage prices in the field are $7.50 per ft. If the contractor had drilled the well on a footage basis instead of the day rate, he would have collected $31,800 for the 4,250-ft. test. Cost of renting the compressors was only $1,750* and total drilling costs were estimated at $5,000. On a day-rate basis, the contractor probably only broke even at best. With air equipment on a footage contract, he might have made over $25,000 profit. In this particular instance, the oil company benefited from the air drilling. But there is no reason why a contractor can't make a profit on the method.

"Continental's experience emphasizes that air drilling is a very inexpensive method of drilling where conditions are favorable. Bit performance on air-drilled holes was from four to eight times better than on fluid-drilled holes."

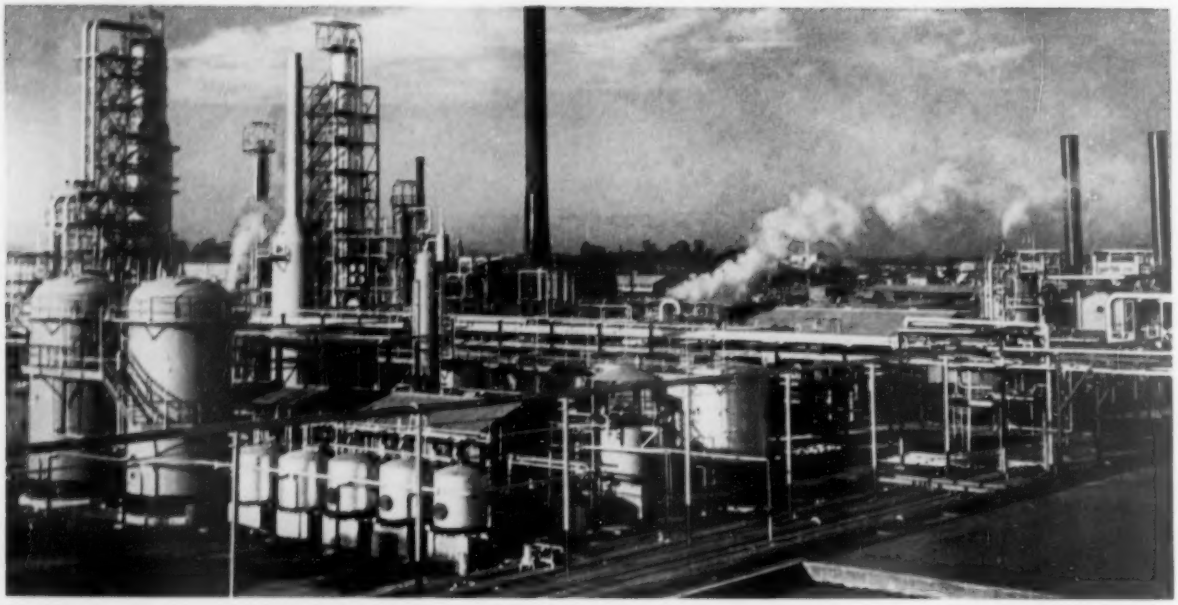
Experience in many areas has shown that, under proper conditions, air drilling will perform every operation on drilling normal to conventional fluid circulation. Fishing operations, diamond coring, milling of casing, and recompletion can be done in a faster, cleaner, and less-expensive manner with air drilling.

Lost circulation normally is reduced greatly, and, more often than not, has been eliminately entirely. Clean rigs are virtually assured in air drilling and this leads to safer operations under more pleasant working conditions.

In arid areas where no convenient adequate water supply exists, air drilling offers added savings by eliminating the need for hauling large quantities of water daily.

Air-drilled wells are completed in a minimum of time because there is no need for bailing and swabbing. Damage to producing zones is held to a minimum and air-drilled wells often have higher initial potentials than offset wells drilled with conventional fluids. Only a few soil-bearing zones have been drilled that will produce oil. However, recognized damage to gas-producing sands or sandy shales occurs because of montmorillonite clays present; these swell when drilled with water-based muds. In these producing zones better gas potentials are the rule with air or gas-drilled holes.

*This $1,750 is cost of the compressors at daily rate. Actually these two compressors must be rented for a minimum period of 5 days. (Average cost for 5 days is $2,225-$2,500.)



CRUDE DISTILLATION . . . Mexico's $31,000,000 lube and wax plant units at Salamanca are tied in with these distillation units. At left in background is the new vacuum column which provides feed stocks for the lube plant. The atmospheric distillation unit is to the right of the vacuum column.

Pemex' Salamanca Lube-Oil Plant Combines . . .

1. Two-stage propane deasphalting
2. Two-stage furfural solvent extraction
3. Three-stage solvent dewaxing

by John C. Reidel

A UNIQUE combination of processes, latest-design features, and a high degree of instrumentation—these certainly make Petroleos Mexicanos' new large lube-oil and wax plant worth writing about.

The $31,000,000 facilities are located in the Central Zone of Mexico near the town of Salamanca, in the State of Guanajuato. This location is central to consumer areas and is easily served by pipeline from Poza Rica field. Location in this primarily agricultural region was also made in order to encourage industrial development of the area. Construction of this large, modern refinery here serves to emphasize the importance of the oil industry in the over-all economy of Mexico. The new lube plant is important to Mexico in that it eliminates a drain in dollar exchange of some $15,000,000 per year formerly required for importation of lube oils.

The lube and wax plant processing described here, such as that involved in the furfural solvent-extraction and in the solvent-dewaxing sections, is among the most complex found in refinery operations. Petroleos Mexicanos engineers have done an excellent job in mastering the over-all processing and the many details attendant to the construction and operation of this plant.

Lube and Wax-Plant Units

Product capacity of the plant is 2,500 bbl. per day of lube-oil blend stocks and 75 tons per day of waxes. The new facilities comprise:

1. **High vacuum distillation unit** with design capacity of 14,700 bbl. per day of topped crude. (A new 40,000-bbl. per day crude desalter unit was also installed.)

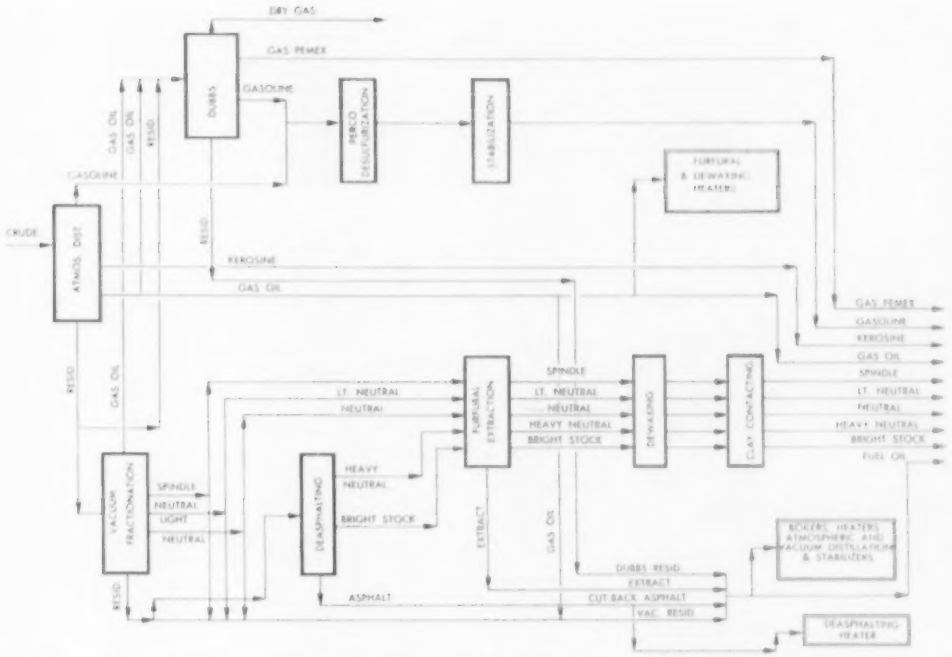
2. **A two-stage propane deasphalting unit** with two-level recovery system. Design capacity is 5,600 bbl. per stream day of vacuum reduced crude and 34,000 bbl. daily of propane solvent. Design yields are as follows:

	Bbl. per day
Low-vis product ("heavy neutral"), approx. 100-110 S.U.s. at 210° F.	1,685
High-vis product ("bright stock"), approx. 250 S.U.s. at 210° F.	1,685
Asphalt (80 pen., 175° F. melting point)	2,230

3. **A two-stage furfural solvent-extraction unit,** with maximum design charge capacity of 4,850 bbl. per day of vacuum distillate or deasphalted oil, to make some 3,000 bbl. daily of raffinate. The twin furfural towers can be operated in parallel or in series, providing a wide flexibility with respect to the variety of lube charge stocks and rate of throughput.

One stage of furfural recovery is provided on the raffinate system and three stages on the extract system.

4. **M.E.K.-toluene solvent dewaxing** with design capacity of close to 3,800 bbl. daily of charge. This plant includes a three-stage filtration section and products and solvent recovery systems. The



PROCESS SCHEME . . . Crude charge consists largely of Poza Rica oil with a small amount of Tenixtepec oil. Original facilities (on stream in 1950) were atmospheric distillation, Dubbs thermal cracking, Perco desulfurization, and stabilization and treating. Fig. 1.

solvent dewaxing plant is highly instrumented including many cascade or interconnected systems for close control.

5. **Vacuum rerun unit** auxiliary to main lube-oil facilities. This reruns stocks to make special products.

6. **A clay contacting unit** for lubricating oil.

7. **Wax-treating unit** consisting of three clay filters (percolation process) and designed to handle a total of nearly 135 tons per calendar day (including wax from Tampico).

8. **A hot oil belt heating system** is provided for sections of the lube and wax plants. This has the advantages that it makes possible close control of temperature and minimizes possibility of coke formation and product degradation.

The lube plant is designed to make the following lubricating oil stock for blending into finished lubes:

Spindle
Light neutral
Neutral
Propane 50 stocks
Propane fraction 250 stocks

Wax shipped in from Tampico is also handled by the new clay percolation unit. Provision has been made for the production of eight separate grades of wax:

Melting point (°F.)	Oil source	Wax type	Wax yield (bbl./day)	°A.P.I.	Tons/day
165-170	250 S.U.s., 80 v.i.	Microcryst.	51.4	28	8.0
165-170	250 S.U.s., 95 v.i.	Microcryst.	82.9	28	12.9
145-165	50 S.U.s., 80 v.i.	Microcryst.	44.8	30	6.9
145-165	50 S.U.s., 95 v.i.	Microcryst.	60.0	30	9.2
130-135	Neutral, 80 v.i.	Crystalline	85.0	33	12.8
130-135	Neutral, 95 v.i.	Crystalline	146.8	37	21.6
126-129	Light neutral	Crystalline	15.0	40	2.2
120-122	Spindle	Crystalline	9.1	42	1.3
Total Salamanca wax			495.0		74.9
120-135	Tampico wax	Crystalline	400.0	34	60.0
Total wax			895.0		134.9

Construction

The new lube and wax-processing facilities were erected by Pemex construction crews and Pemex engineers. This major construction project was financed in its entirety within Mexico — about half of the capital investment coming from Pemex's own funds and the rest from the National Savings Bond Administration of Mexico.

Arthur G. McKee & Co. was the over-all contractor in design of the new plant with aid from Esso Development Co., licensor of the propane deasphalting process, and Texaco Development Co., licensor of the furfural extraction and M.E.K.-toluene solvent dewaxing processes.

1. Salamanca Process Scheme

The Salamanca refinery is a new refinery. It was built to meet increased demands in the Central Zone of Mexico for motor, tractor, and railroad fuel. The refinery first went on stream in 1950. A box-flow diagram (Fig. 1) shows how the original facilities tie in with the new lube and wax plant units. The original installations included atmospheric crude distillation, Dubbs thermal cracking and gas concentration plant, Perco catalytic desulfurization, and treating and blending facilities.

The charge to atmospheric distillation is made up largely of crude oil from Poza Rica field with a relatively smaller amount of Tenixtepec crude oil. Topped crude from the atmospheric distillation section goes to the new high-vacuum tower, installation of which makes it possible to raise the throughput capacity of the Salamanca refinery from 30,000 to 40,000 bbl. per day. A new crude-desalting unit was also installed. This is designed to handle 40,000 bbl. daily of Poza Rica crude and to reduce the salt content to 5 per cent of the original or 6 lb. per 1,000 bbl.

High-vacuum unit . . . This is provided with three sidedraws and strippers to take off spindle, light neutral, and neutral stocks. The high-vacuum unit was designed to operate as a combination unit with the atmospheric unit. But it can operate independently, taking charge from storage, if the atmospheric column should be out of service.

Initially the vacuum tower has been operating with two sidestreams being taken off. Average yields for initial operation, when making light neutral and neutral, are:

	Liq. vol. per cent
Gas oil	15.0
Light neutral	11.5
Neutral	10.0
Residuum	61.5
Loss	2.0

In the alternate case, where spindle and light neutral were taken off as sidestreams, yields were:

	Liq. vol. per cent
Gas oil	2.5
Spindle	12.0
Light neutral	17.0
Residuum	66.5
Loss	2.0

Actually, since demand at present for spindle oil is relatively small, the vacuum tower as a rule is operating with production of the two neutrals as sidecuts.

Operation of the vacuum unit is conventional. Topped crude goes through the vacuum unit heater and enters the vacuum-tower flash zone. Lube cuts are flashed off into the rectifying section, while bottom material is stripped with steam. Two external reflux pump-arounds are provided. Instrumentation is provided to control rate of feed to tower, temperature, end point and rate of withdrawal of the sidedraws, top temperature, etc.

2. Lubricating-Oil Plant

Residual oil (bottoms from the high vacuum tower) are deasphalted by contacting with liquid propane in two stages, providing the equivalent of a heavy neutral and a bright stock suitable for furfural extraction.

Two-Stage Propane Deasphalting

In the propane (or so-called "cold") fractionation, propane and the oil to be deasphalted are first charged to the high-pressure deasphalting tower. Most of the propane is usually fed to the lower part of the tower although some can be charged above or below the normal interface. The oil feed ordinarily goes into the upper third of the tower.

Propane treating . . . Since the propane deasphalting tower operates like a conventional distillation tower turned upside down, heat is applied by internal steam coils at the top of the column. This effects refluxing and corresponding fractionation as the propane flows upward contacting the downcoming oil, with precipitation of resinous materials near the top of the column.

Propane with the desired lighter oil fraction in solution leaves the top of the light solution tower (high-pressure or primary deasphalting tower) and the solution goes to the high-pressure solvent-recovery system.

Normally the primary and secondary propane towers are operated in series. The lower phase solution from the bottom of the primary tower is fed (by pressure differential) into the upper third of the secondary or heavy solution tower. Here it is contacted with additional propane. Heat is applied at the top by steam coils as in the primary tower. The heavier oil fraction together with most of the solvent leaves the top of the secondary or heavy solution tower and goes to the low-pressure solvent-recovery system.

Propane recovery . . . In the high-pressure recovery system, the light oil fraction-propane solution first goes to the light solution evaporator No. 1. Here most of the propane is vaporized with low-pressure steam. The residual solution passes from the No. 1 evaporator to the No. 2 evaporator where additional propane is vaporized by heating with high-pressure steam. The propane vapors from the two evaporators go through the high-pressure propane condensers and back to the high-pressure propane accumulator.

The remaining solution from the No. 2 evaporator is then flashed at intermediate pressure in the light solution flash tower. The resulting propane vapor is returned through the low-pressure propane condensers to the low-pressure propane accumulator without recompression. Residual liquid from the flash tower goes to the light product stripper. Here steam at atmospheric pressure is used to remove the remainder of the propane and the resulting light deasphalted oil product goes through a cooler to storage.

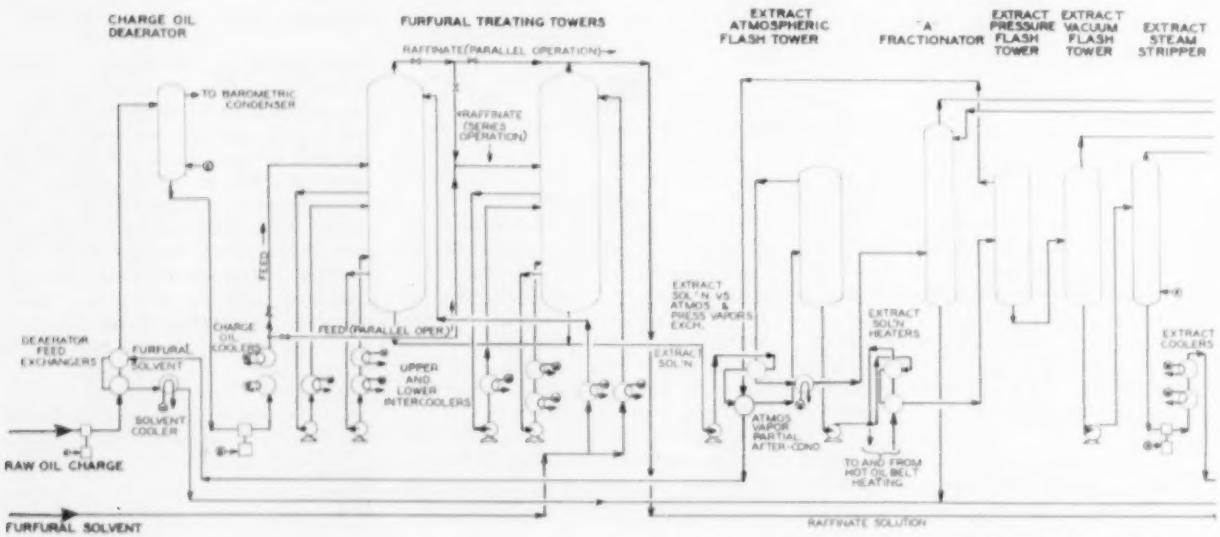
Low-pressure recovery system . . . The heavy-oil fraction with propane from the top of the secondary propane tower is processed similarly in the No. 1 and No. 2 evaporators of the low-pressure recovery system. Propane vapors from these evaporators return to the intermediate pressure system and through the low-pressure propane condensers to the low-pressure propane accumulator. Remaining solution from the heavy solution evaporator No. 2 goes to the heavy product stripper. Here remaining propane is removed at atmospheric pressure and the heavy oil product is cooled to storage.

Bottoms from the secondary propane tower go to the asphalt furnace. Here most of the propane is vaporized and this propane is separated in the asphalt flash drum and returned to the intermediate pressure system. Steam removes the remaining propane in an asphalt stripper and the asphalt is cut back with gas oil to make fuel oil.

Propane vapors from the heavy product stripper and asphalt stripper go to a direct-contact condenser and the propane is recompressed back to the intermediate pressure system.

Furfural Solvent Extraction

Fig. 2 is a simplified flow sheet of the furfural extraction section of the Salamanca lube plant. Flow of charge



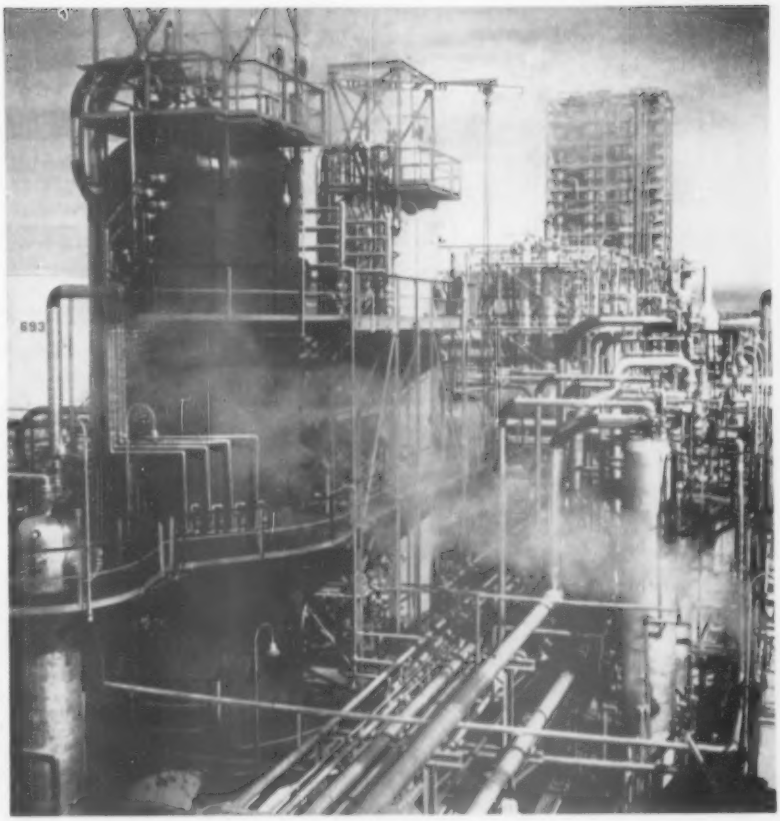
oil to the twin furfural treating towers is indicated for either parallel or series operation. Normally parallel operation is employed. However, where close separation must be made or a charge stock is encountered which proves difficult to treat, the two towers may be operated in series.

Furfural treating . . . Charge oil is pumped through the deaerator feed exchangers where it exchanges heat with furfural solvent from the extract recovery system. The oil feed is then charged to the deaerator which is under high vacuum and in which oil charge is stripped by steam. This removes air in order to minimize oxidation and possible attendant coking. From the deaerator the charge oil goes through charge-oil coolers to the furfural treating towers.

Oil feed enters the furfural tower at one of several points just above the center section and flows upward, contacting furfural coming down from the top of the tower. Oil is ordinarily the continuous phase and furfural the dispersed phase as oil and solvent contact each other through ceramic-packed sections. As the oil feed flows upward the more paraffinic constituents of the oil charge form a raffinate phase. This phase, containing a relatively small amount of solvent, goes overhead from the furfural tower to the raffinate recovery section where it is heated, flashed to remove most of the furfural, and steam stripped to remove the remaining furfural.

The extract solution from the bottom of the furfural treating tower is taken to the extract recovery system where it goes through the three stages of flashing with remaining furfural removed in the extract stripper.

Since the furfural has picked up water due to steam stripping a constant-boiling-mixture of furfural-water is formed. This is separated in the C.B.M. drum into a water layer and a furfural layer and from these layers dry furfural solvent is obtained in the furfural recovery train ("A" and "B" fractionators).



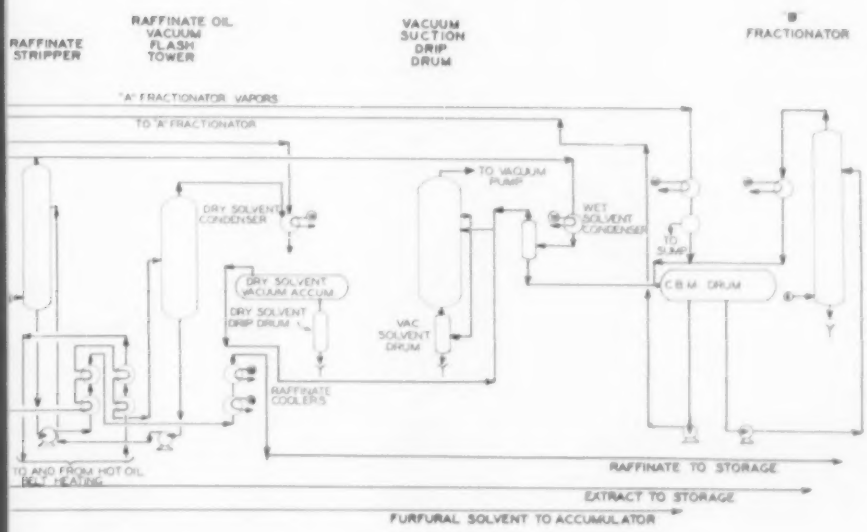
PROPANE AND FURFURAL TREATING . . . The propane deasphalting towers are in foreground and twin furfural solvent extraction columns toward the back.

Intercoolers . . . Upper and lower intercoolers are provided on the furfural towers. This aids in control of the temperature gradient through the tower to obtain most efficient extraction and best yield of refined oil.

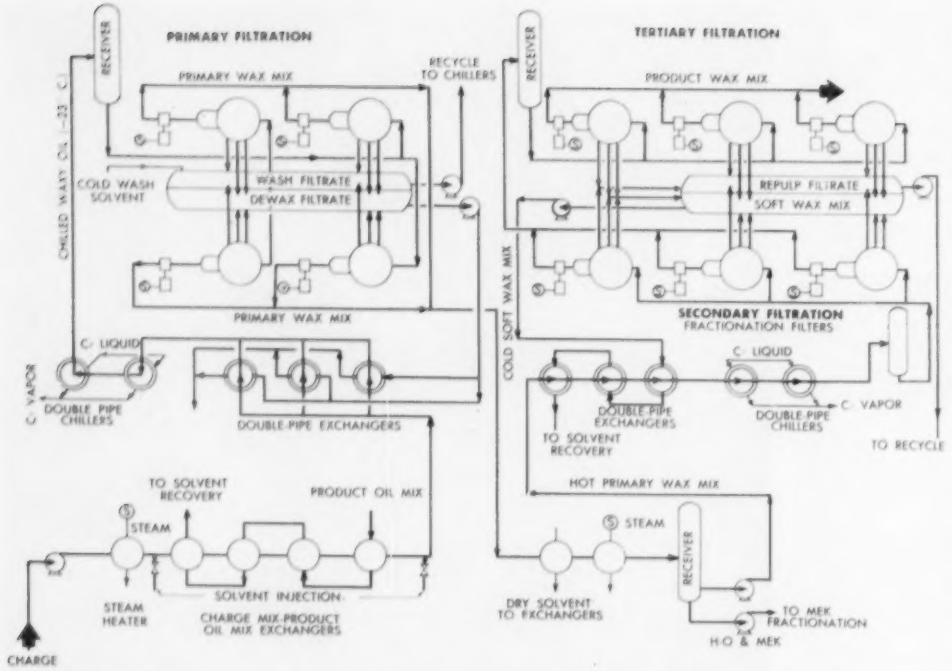
Series or parallel . . . In the usual parallel operation the oil charge is split into two streams, each regulated by a flow-recording controller. Furfural feed is similarly split and under flow control to each tower. The raffinates from each tower are combined for return to the raffinate recovery system.

Should it be desired to operate the towers in series, all of the oil charge is of course fed to the first tower. The raffinate mix coming overhead from the primary tower would then be fed to the secondary tower.

Raffinate recovery system . . . The raffinate solution coming overhead from



FURFURAL SOLVENT EXTRACTION . . . Twin furfural treating towers are provided. Normally operation is in parallel, but series operation is possible. Three stages of furfural recovery from the extract are provided. The three-stage flashing is in the order: atmospheric, pressure, and vacuum to obtain best heat economy. Fig. 2.



SOLVENT DEWAXING . . . Three stages of filtration are provided to obtain wide flexibility: (1) primary, (2) secondary or wax fractionation, and (3) tertiary or repulp filtration. Fig. 3.

the furfural treating towers goes through the raffinate-raffinate solution exchangers. Here it picks up heat from hot raffinate going to storage. The raffinate solution is further heated, by hot gas oil from the belt heating system, in the raffinate heaters.

The bulk of the furfural is removed from the raffinate solution in the raffinate oil vacuum flash tower. The furfural vapors are condensed in the dry solvent condenser.

The small amount of furfural remaining is removed from the raffinate by steam stripping in the raffinate stripper. The raffinate is cooled in the raffinate-raffinate solution exchangers and in water coolers on its way to rundown storage.

Extract recovery system . . . The combined extract solutions from the bottom of each treating tower are handled by the extract pumpout pump. The discharge of this pump is throttled by a pneumatic diaphragm control valve operated by a flow recording controller. Another flow recording controller regulates withdrawal of raffinate from the top of the column. A level recording controller in the bottom of each treating tower pneumatically resets both flow controllers to regulate rate of withdrawal of extract solution in proportion to rate of withdrawal of raffinate solution. In this manner it is intended to hold a reasonably steady average interface level in each treating tower.

The three-stage flashing takes place in this manner: Atmospheric, pressure and vacuum arrangement is such as to obtain maximum heat economy. Extract solution-pressure vapors heat exchangers. It is then flashed at atmospheric pressure. About one-third of the furfural is vaporized here. Residual liquid with the remainder of the furfural is pumped through the extract solution heaters, where it is heated by hot circulating gas oil, and enters the extract pressure flash tower.

The bulk of the remaining furfural is vaporized in the pressure flash at about 40 psig. The extract with a small amount of furfural then goes by pressure differential to the vacuum flash tower. Final removal of furfural is accomplished in the extract steam stripper.

Furfural recovery train . . . Overhead vapors from the extract and raffinate steam strippers are condensed in the wet solvent condenser and flow into the constant-boiling-mixture drum. Here separation takes place into an upper furfural layer (consisting mostly of furfural with a small amount of water) and a lower water layer (consisting mostly of water with a small amount of furfural).

The water layer is fed to the top of the "B" fractionator or water removal tower. Steam is injected at the bottom to remove furfural from the downflowing water forming the constant boiling mixture (containing 35 per cent furfural). The vapor is condensed in the "B" fractionator condenser and goes back into the constant-boiling mixture drum where separation into layers takes place as mentioned. Furfural-free water from the bottom of the "B" fractionator goes to the sewer.

The furfural layer from the constant-boiling-mixture drum is pumped to the top of the "A" fractionator where it contacts ascending hot furfural vapors which boil off water. The water together with some furfural goes overhead through the "A" fractionator condenser. Water-free furfural is withdrawn from the bottom of the "A" fractionator to the furfural accumulator.

The extract atmospheric flash vapors coming to the "A" fractionator may be all or partly condensed before entering the "A" column depending on heat level required to remove water from the wet furfural charge. Provision is also made for injection of hot furfural vapors from the extract pressure flash tower into the bottom section of the "A" fractionator.

3. Wax Plant

The Salamanca wax plant is interesting in the complete processing which is provided and in the high degree of instrumentation. A total of 140 instruments are employed. A large central panel board has been provided for the wax plant. Extensive use is made of cascade (interconnected) control.

What is involved . . . Wax processing embodies these main activities: (1) receipt and blending of solvents; (2) charge oil chilling; (3) continuous dewaxing filtration or primary filtration; (4) primary wax mix chilling; (5) wax fractionation filtration or secondary filtration; (6) repulp or third-stage filtration; (7) solvent chilling; (8) products recovery for dewaxed oil, hard product wax, and soft wax; (9) solvent recovery; (10) flue gas generation and chilling of inert gas; and (11) propane refrigeration.

This listing of wax-plant sections, while it is impressive, does not fully convey the complexity of the flow and process details involved in Salamanca wax plant operation. All three stages of filtration may be employed as indi-

Magcobar means more
than mud alone ... it means ...
Highest Quality
Drilling muds are called upon almost every day to help with some new circulation or pressure control problem . . . and to do the old jobs better. To many operators, "Magcobar Quality" is best represented by expert field engineering service. Still others interpret Magcobar quality in terms of product purity and uniformity . . . in product availability through more than 400 warehouse stocks . . . in product research and development . . . in the industry's most complete line of drilling mud products provided by Magcobar. But whatever yardstick you apply to drilling mud quality, you will find that Magcobar measures highest. Whether you drill in Canada, Colorado or the Gulf Coast . . . anywhere in the world . . . the full resources of **Magcobar quality** are available for your well.
Magcobar
Complete
DRILLING MUD SERVICE
MAGNET COVE BARIUM CORPORATION
HOUSTON, TEXAS

Always ready . . . always able to handle your drop forge designs

Bethlehem's drop forge shops are ready for you—always!

You can depend upon us for volume production. Even more important, you have the assurance of expert workmanship. Unless you have been through the Bethlehem shops, it is hard to visualize their full extent and the care with which each step in an order is handled.

Bethlehem produces an almost endless variety of designs for the oil, mining, aviation, automotive, electrical, and other industries. This is made possible by strictly first-class facilities, which include a modern die-sinking plant, steam and board drop hammers to 8,000 lb, mechanical presses to 3,000 tons, upsetters to 9 in., and full heat-treating equipment.

We're anxious to do business with you. Why not call us when you are next in the market for closed-die forgings? You'll find our prices and deliveries are fully competitive.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

cated in Fig. 3 or only two stages depending on the charge and products desired.

Wax plant processing . . . The flow sheet, Fig. 3, is a much simplified diagram of the wax plant processing.

The waxy, furfural-refined charge oil goes through a steam heater, initial solvent is injected into it, and it is chilled by heat exchange against product oil mix in shell-and-tube exchangers. It is further chilled in double-pipe exchangers by heat exchange against primary filtrate, and in double-pipe chillers by evaporation of propane in the annulus. Chilling is carried out in stages as noted and provision is made for solvent injection at various points during chilling. Incremental dilution can thus be carried out, with the temperature of the incremental solvent being the same as that of the charge mix at each particular point of injection.

Filters . . . Ten Goslin-Birmingham continuous vacuum filters, each with a surface area of 500 sq. ft., have been provided. All of these can be used if a simple dewaxing operation were conducted. Ordinarily, however, both wax fractionation and repulp filtration will be employed and the filters will be divided between the three different filtration operations as indicated by Fig. 3.

The wax cake resulting from primary filtration is continuously washed with solvent to remove oil from the wax. Filtrate from washing of the up-side of the filter together with the filtrate from the charge mix, enter the dewax filtrate section of the filtrate receiver. Filtrate resulting from washing the cake on the down side of the filter discharges from top vacuum outlet and enters wash filtrate section of filtrate receiver.

Wax fractionation . . . The wax from the primary dewaxing filters, containing some 70 per cent solvent and 10 per cent oil, is diluated, heated by heat exchange, and then taken from a feed drum by the wax fractionation pump through three scraped surface double pipe exchangers (heat exchanged against cold soft wax mix) and two scraped surface double pipe chillers (propane chilling) before entering the wax fractionation (secondary) filtration. In the wax-fractionation filters separation of the raw slack wax is made into a hard wax (lower oil content and higher melting point) and a soft wax.

The wax-fractionation filtration is conducted at a higher temperature than the primary filtration and solvent at an intermediate temperature is used, to conserve refrigeration.

Repulp . . . The wax cake from the secondary filtration is again diluted and goes through the repulp filters. This is conducted at the same temperature as the wax fractionation, hence no heating or rechilling is required at this point. The wax with some 60 per cent solvent obtained from the repulp filtration goes to the product wax mix surge tank and to the recovery section.

Products recovery . . . The product wax mix from the repulp filters is heated and flashed to remove solvent and remaining solvent is stripped with steam. The wax fractionation filtrate receiver is divided into two sections by a baffle, one section holding repulp filtrate which is mostly solvent and the other holding wax fractionation filtrate which is mostly oil and soft waxes. The repulp filtrate is recycled while the wax fractionation filtrate goes to the soft wax recovery. Dewaxing filtrate from the primary filtration also goes to the products recovery section for separation of solvent.

Auxiliary operations necessary to proper operation of the Salamanca wax plant also include: solvent chilling, M.E.K.-water separation and an inert gas-generation system. The inert gas is used to blanket drums, receivers and filters to prevent formation of explosive mixtures in the dewaxing unit equipment.

4. Hot Oil Belt Heating

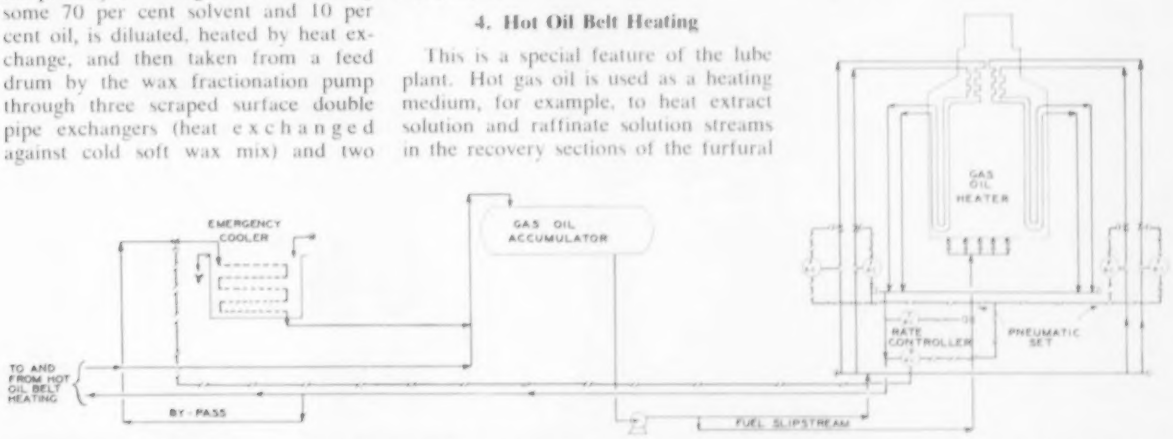
This is a special feature of the lube plant. Hot gas oil is used as a heating medium, for example, to heat extract solution and raffinate solution streams in the recovery sections of the furfural plant. It is also employed in certain areas of the wax plant where a temperature level of 400°-450° F. is required.

Gas-oil circulation . . . Fig. 4 indicates the hot gas oil system and some of the instrumentation involved. A 35° A.P.I. gas oil is employed. This is pumped from the gas oil accumulator through the direct-fired heater where it is heated to about 575° F. It circulates through the extract and raffinate solution heaters and comes back to the accumulator at around 400° F. A bypass is provided through emergency cooler.

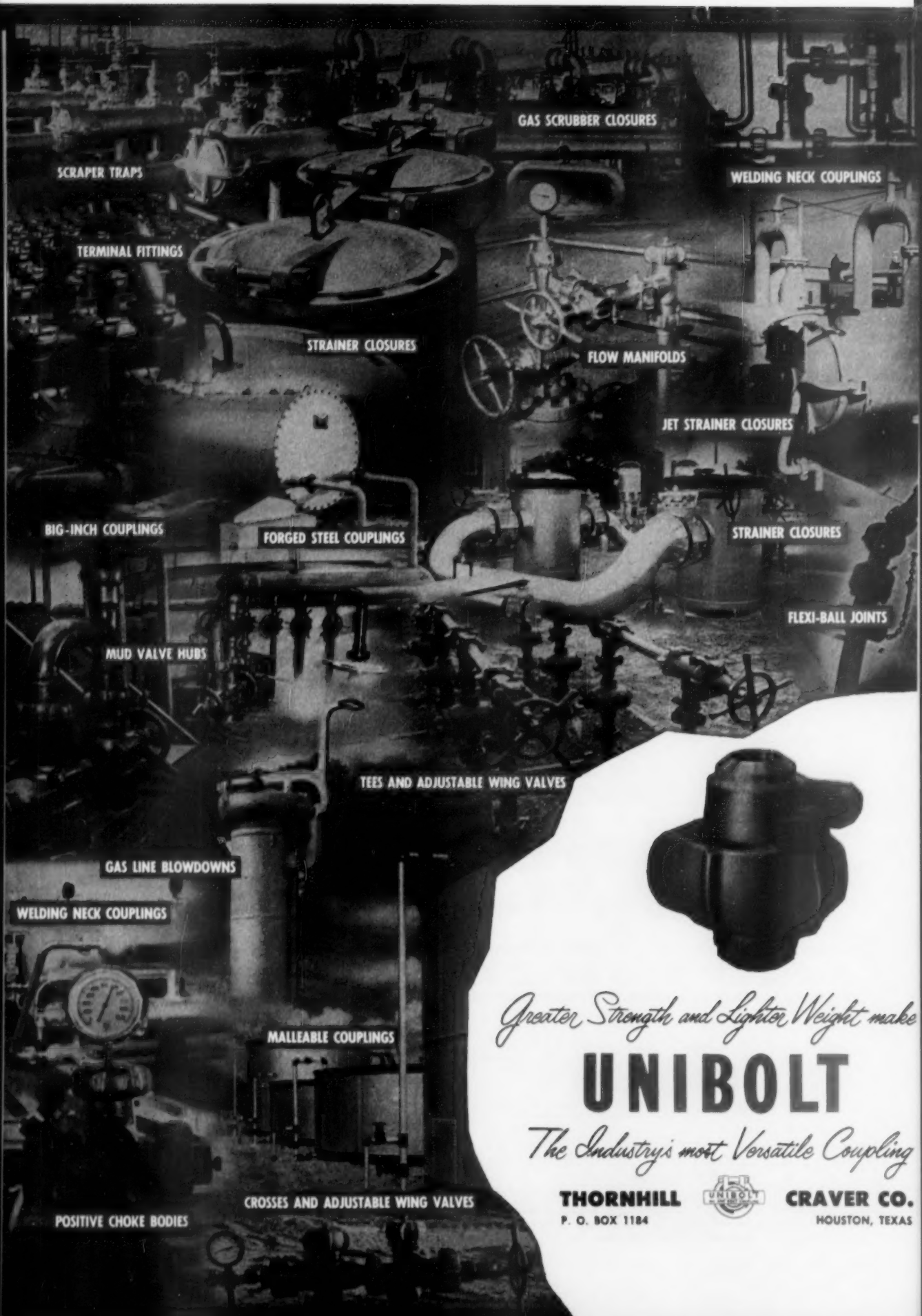
Instrumentation . . . Gas oil to the heater is split into four streams. Each of these is controlled by a flow controller. The four flow controllers are reset by a pressure controller on the combined outlet line from the heater.

This pressure controller works on a split-range basis. The four control valves in the four lines to the heater are provided with adjustable limit stops so that the valves may be set for a given minimum throttling. The four flow controllers throttle their respective valves, according to the dictate of the master pressure controller, over the range down to the minimum setting. At this point the pressure controller operates the control valve in the bypass to the emergency cooler, allowing gas oil to pass through the cooler, in the event that flow to and from the hot oil belt heating system is cut short.

Also shown in Fig. 4 is a temperature recording controller, with measuring element in the combined outlet line from the heater. This controller operates the control valve in the gas oil slipstream to the burners. To overcome the great lag through the heater, this instrument is a rate or derivative controller. It is provided with a rate time range of 1 to 5 minutes.



HOT OIL BELT HEATING . . . A 35° A.P.I. gas oil is employed for oil belt heating in lube and wax plant units. Control is obtained by a pressure recording-controller operating on split-range basis to reset flow controllers regulating flow to each bank of the heater. In addition a bypass through the emergency cooler is provided. Fig. 4.



Greater Strength and Lighter Weight make

UNIBOLT

The Industry's most Versatile Coupling

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

Want to Improve Your Reading?

Here are two ways to improve w.p.m. and comprehension

by Dr. Nila Banton Smith

Part 3

A. How to Read Paragraphs

PERHAPS no one technique will aid you more in improving your reading ability than learning to read paragraphs effectually. Every selection is made up of paragraphs. Each paragraph is a unit of thought in itself. Mastering the art of quickly grasping the essence of each of these thought units enables you to cover reading materials rapidly and, at the same time, to get the most important ideas.

In most paragraphs there is one point which the author makes that is of fundamental importance. The other details presented in the paragraph revolve around this hub idea, expanding upon it, giving additional details concerning it.

The key . . . The position of the key sentence in a paragraph varies. Often the germ idea appears in the first sentence. If so, this is a convenience to the reader because he doesn't have to search through the entire paragraph to find the central thought. At other times, the important idea occurs in the middle, at the end, or somewhere else in the paragraph.

The first and most important thing you must do is to develop a new attitude toward paragraph reading — the attitude of thinking of each paragraph as a whole in itself. As you encounter each new paragraph, view that paragraph as if it were all the reading material that you have before you at the moment. Determine what the **one** important thing is which this particular paragraph has to tell you.

To find out with certainty what one most important idea is in any paragraph, you should ask yourself two things:

1. What is the basic thing, place, condition or person discussed in this paragraph?

2. What does this thing, place, condition or person do or what is done to it, or what property does it have, or what condition is it in which makes it worth while for the author to say something about this topic on paper?

Keep these questions in mind while studying the paragraph below. See if you can locate the main idea with certainty.

First Test Paragraph

> The calcium cycle is one of the most interesting cycles of nature. The ocean contains vast quantities of calcium salts in solution. These are withdrawn by living creatures and built into coral reefs and the shells of mollusks and are precipitated in other ways. In the course of geologic time, deposits of calcium carbonate laid down in the ocean become lifted up from limestone strata in mountain ranges. These formations are then attacked by atmospheric and organic acids and slowly dissolved and carried back into the sea from which they came. Sometimes great caves are left behind as a result of this process and many secondary calcite and aragonite formations come into existence.*

1. What is the basic topic discussed in this paragraph?

2. What special property does it have?

3. At what position in this paragraph did you find the key sentence?

If you analyzed this paragraph correctly, you will have concluded that the main topic is "the calcium cycle," and that the special property which the calcium cycle possesses is that it "is one of the most interesting cycles of nature." All of the remaining sentences in the paragraph are subordinate details to the calcium cycle.

See if you can quickly find the main idea in the paragraph below.

Second Test Paragraph

> A fraction over 2 minutes is all it takes to run the Kentucky Derby at Churchill Downs in Louisville. But the derby packs more excitement into these two minutes than and other sporting event in the country. The Derby Day "Run for the Roses" dates back to 1875 when a little red horse named Aristides came in first. There were 12,000 spectators on hand then. More than 100,000 attend now, and millions more watch or listen with breathless interest on TV and radio. The buildup or excitement increases year by year.

1. What is the basic subject of discussion in this paragraph?

2. What does this subject do that is distinctive?

3. In what position in the paragraph do you find this information?

4. What is the function of all of the other sentences in the paragraph as related to this topic sentence?

If you were right in your analysis, you decided that "the derby" is the basic subject of discussion and that the distinctive thing which this subject does is that it "packs more excitement into these 2 minutes than any other sporting event in the country." All of the other sentences are related to the subject of the derby and expand upon this main idea.

*Lewis W. Scott, Cycles in Nature, Hobbies, LII, No. 6 (August 1947), 138.

B. How to Read and Recall Details

There is another type of reading which is much more difficult than reading easy narrative or nontechnical content. This is the reading of factual material in which you want to grasp all of the particulars.

The following is directed toward the dual purpose of helping you: (1) to read and comprehend detailed facts as rapidly as possible, and (2) to remember those facts once you understand them.

In this matter of grasping details the

The author is director of the Reading Institute at New York University. The three articles in this series are from Dr. Smith's forthcoming book, "Reading Improvement for Adults," which will be published by Prentice-Hall.

first point is to find the main idea in each paragraph. Second, find the important details that relate to this main idea. As you read, think of the main idea as a magnet drawing the particles toward it—the "particles" being the smaller and detailed ideas. Then visualize the main idea together with its cluster of subideas as a unit in itself. In a nutshell these are the processes which will enable you to grasp and hold in mind a series of minor factual details.

As a word of caution: don't try to understand or to recall one isolated fact. You must attach "handles" to each bare fact so that you will have something "to take hold off" when you want to pull it back. The best way to attach "handles" to a bare fact is to think of it in relation to the main idea and to other subordinate ideas; that is, to associate it with the total unit of thought.

Material Which Involves Numbers

Some people are under the impression that factual material which includes numbers is more difficult to read and recall than text which contains words only. As a matter of fact, it is often easier to remember details containing number facts than those made up of word facts alone.

Test 1—Noting Number Relationships

Read the paragraph below. Write answers to the questions.

> For any one connected with the top management of the war, the writing of memoirs seems to be a profitable and prevalent occupation. General Eisenhower is said to have sold his memoirs for a sum somewhere between $500,000 and $750,000. This information is reported with a comment which imputes to the general some extraordinary prescience in the matter of federal income taxes that saved him about $275,000.*

What is the main idea? Write it in the fewest possible words:

What two facts are told which expand upon this idea? Write each one in the fewest possible words:

(1)

(2)

Your answer to the first question should be something like this: "Writing memoirs is profitable." This idea is the "heart" of the whole paragraph.

*Taxes, XXVI, (April 1948), 292.

After stating the main idea, the paragraph expands upon this basic thought by giving examples which reinforce it. Two detailed statements follow which are related to the main idea that "writing memoirs is profitable." The essence of these lesser statements in turn are that: (1) Eisenhower sold his memoirs for between $500,000 and $750,000, and (2) he saved $275,000 in income tax.

Now lift your eyes from the page. Tell yourself the main idea and the two related lesser ideas in this paragraph.

Did you have some trouble in remembering the exact amounts of money? If so, use the technique of thinking in terms of relationships between the numbers. Fix one basic figure in mind and relate the other figures to it, proportionately.

Test 2—Noting Number Relationships

Read the paragraph below and write answers to the questions. Be sure to read with care the explanations in parenthesis which follow the (1), (2), (3), (4) divisions of the outline. In each case these explanations will help you in building relationships which in turn will aid recall. (It might be added that following the explanations and directions in studying these paragraphs is practice in itself in detailed reading.)

> Mrs. Baker saved us money as a collector. She worked for 2 hours a day when we needed her over a period of 3 years. During this period her salary amounted to $1,514.25. Her collections of delinquent accounts over this same period amounted to $15,127.00. If these accounts had been collected by a commercial agency, they would have charged one-third of the total amount for their fee. So the saving was considerable.

Write your answers:

What is the main idea of this paragraph?

What are the exact details which tell how Mrs. Baker saved her firm money?

☐ 1. The first set of details is concerned with two small numbers one of which follows the other in consecutive order. noting this relationship should help you to recall numbers.

☐ 2. When writing the second detailed idea, state the figures involved in a round number. It will be easier to remember a round number than a sum involving a small amount in dollars and cents.

☐ 3. In writing the third detailed statement, again write the figures in a round number. Is there any similarity between the round number in (2) and the round number in (3)? What fractional part of the sum in (2) is the sum in (3)? Noting this similarity and relationship will help you to recall both numbers.

☐ 4. When writing your condensed statement of the fourth detail think about the fraction particularly. That's an easy number of remember.

Now that this fourth item has been written, figure out in round numbers what the fractional part of the total amount would be in dollars. White this sum on the blank opposite (5). What is the relationship between this sum and the sum mentioned in (2) in terms of round numbers in both cases?

☐ 5.

Your statement for the main idea should be: "Mrs. Baker saved her firm money as a collector." This is the "hub" idea in the paragraph. The answers which state the details related to this main idea are as follows: (1) She worked 2 hours a day for 3 years (the consecutive order or 2 and 3 makes it easy to remember these two numbers); (2) Her salary was $1,500; (3) She collected $15,000 (the similarity of figures in the two numbers $1,500 and $15,000 and their relative proportion give you "handles" to take hold of in remembering them. At a glance you see that her salary was only 10 per cent of her collections); (4) A commercial collector would have charged one-third of the total collections ($5,000). The fraction one-third is a number that you will have no trouble at all in recalling.

As a result of your study and practice in building associations by noting relationships, you should recall the accurate answers to the detailed questions below with practically no effort at all. It is assumed that you are starting with this knowledge: the main thought of the paragraph is "Mrs. Baker saved her company money." Now test your recall of details:

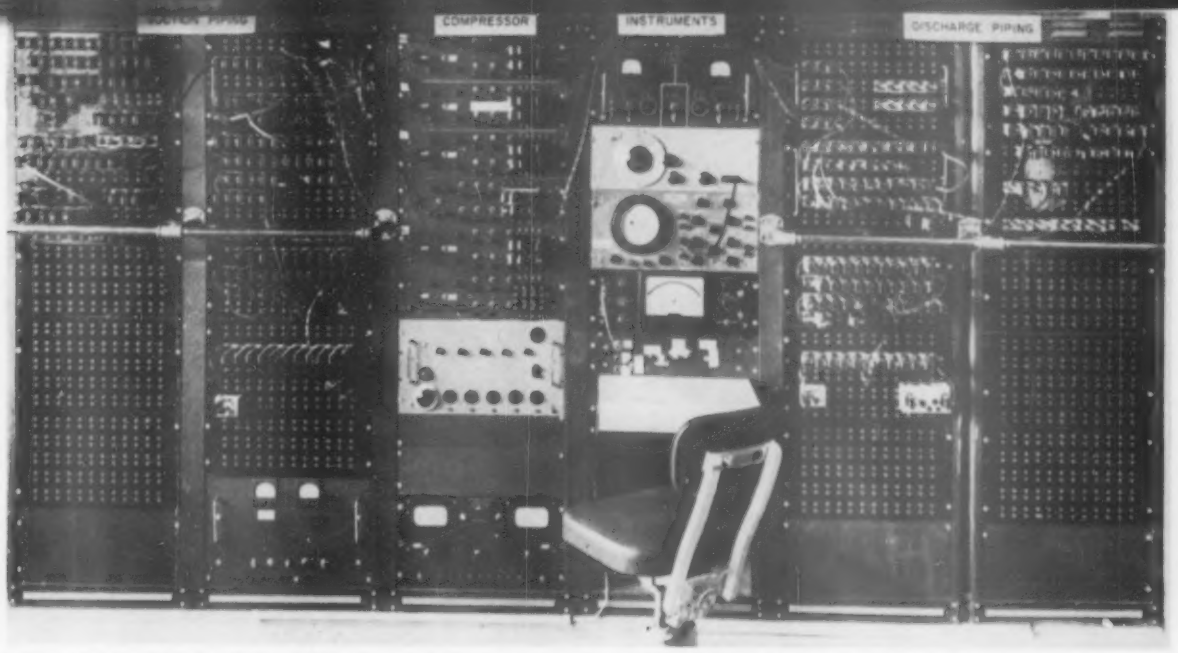
1. How many hours per day for how many years did Mrs. Baker work for the firm?

2. What did she earn during that time?

3. How much did she collect for the company?

4. How much would a commercial concern have charged to make these collections?

5. How much did Mrs. Baker save her firm?



THE S.G.A.'S COMPRESSOR ANALOG, the instrument which outmodes present methods of designing compressor piping. Fig. 1.

REPORT: Piping design for

Pulsation Control and Maximum Compressor Efficiency

Part 1 of this article, in last week's issue, told why presently used analytical methods are not capable of predicting performance of piping and dampeners as regards pulsation control and compressor efficiency. The electrical analog is. This concluding article tells how the analog is used, what data it will give, and how those data are applied in designing a compressor installation.

by James M. Sharp and Edward N. Henderson

PART 2

FOR the past 3 years, an intensive research program has been conducted involving the study of pulsations in gas pipelines. Theoretical and experimental studies have been made on causes and effects of pulsations and the development of new methods of pulsation control. Also, the program has permitted an evaluation of the several methods used in the industry for the design of pulsation dampeners.

Certain of the limitations of existing methods of compressor piping design are obvious from an analysis of the derivation of these methods; others have become apparent from field tests and studies conducted with an electrical analog of compressor installations. Existing methods depend almost exclusively on the design of a pulsation dampener to meet predetermined pressure transmission requirements.

The results obtained in this research program show that these methods fail to provide an accurate prediction of the pressure transmission characteristics of a dampener. Also, the results point out the impracticability of designing a universal dampener which can be used on many types of compressors under a wide range of operating conditions. The program has further shown the importance of designing piping from the standpoint of compressor efficiency and cylinder loading—considerations completely neglected in present design methods.

Authors are with Southwest Research Institute and Arkansas Louisiana Gas Co., respectively.

Theoretical and Experimental Design Methods

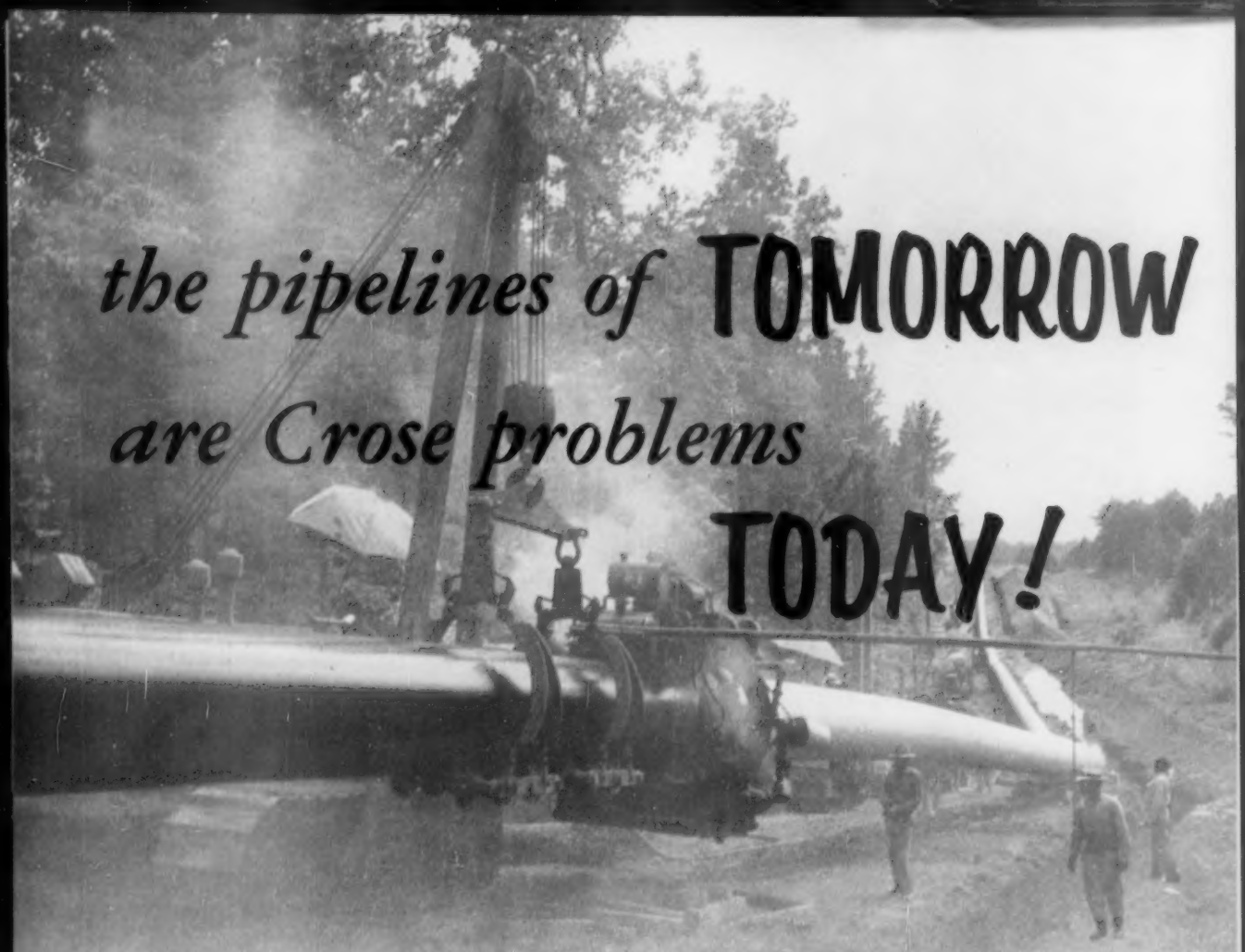
In Part 1 of this article, which appeared in last week's issue, the capabilities and limitations of the more common theoretical methods for designing compressor piping were discussed. The conclusion was drawn that these procedures are inadequate from several standpoints.

There is, of course, an alternative. An experimental approach or a combined experimental and theoretical approach can be used. This would involve field measurements at compressor installations or laboratory measurements on scale models of piping configurations; however, the experimental approach is extremely costly for the amount of information obtainable.

Field measurements at compressor stations would be very desirable except that (1) it is nearly impossible to control and vary the test conditions without interfering with station operation, (2) the effect of any one operating variable cannot be determined independently of the other variables, (3) there are not enough instrument fittings in the compressor piping to provide measurements at a sufficient number of points to evaluate the performance, and (4) the measurements usually must be made under very adverse conditions.

The S.G.A. Pulsation Research Project

In view of the limitations inherent to both theoretical and experimental approaches to the design of compressor piping and the growing need for designs which provide maximum safety



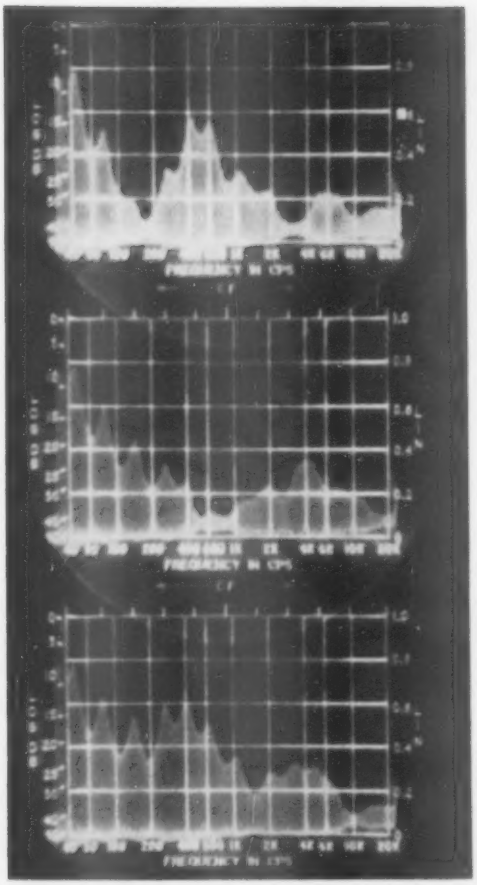
the pipelines of TOMORROW *are Crose problems* TODAY!

Crose engineering and research is constantly working to develop new and better pipeline construction equipment. The 36" cleaning and priming machines — coating and wrapping machines used on the Transcontinental Gas Pipeline job were the result of Crose engineering and research. The machines, largest of their kind, show the forward thinking of Crose designers. Whatever equipment tomorrow's pipelines will demand — you can bet that Crose will build it.

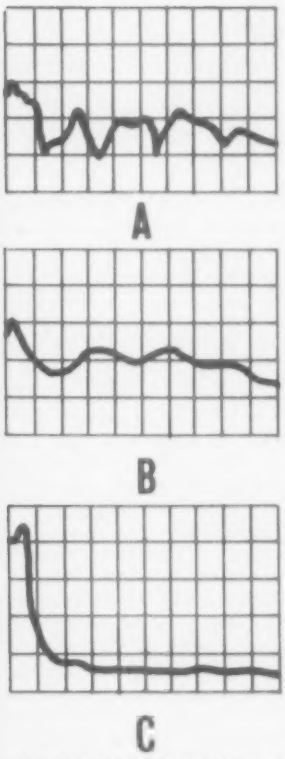
M. J. Crose Manufacturing Company, Inc.

2715 DAWSON ROAD
PHONE MAdison 6-2172
TULSA, OKLAHOMA

15225 EAST COLFAX AVENUE, AURORA, COLORADO
500 FIFTH AVENUE, NEW YORK CITY
DISTRIBUTORS:
CROSE-CURRAN LTD., EDMONTON
CROSE PIPELINE EQUIPMENT CO., INC., NEWARK, N. J.
PIPELINE SUPPLY CO., HOUSTON



TRANSMISSION CURVES show how per cent transmission varies as dampener is excited at three different nozzle locations. Fig. 2.



IMPORTANCE of including all piping when making calculations of a transmission surve is shown by these three curves obtained with the analog. Curve A is for discharge piping including bypass. Curve B is for same piping without bypass. Curve C is for specially designed double expansion chamber dampener. Fig. 3.

through the control of pulsations and which, at the same time, improve the efficiency of the compressor, 20 member companies of the Southern Gas Association have sponsored a research project on pulsation suppression at the Southwest Research Institute. This has resulted in development of an electrical analog for the study of piping-design problems.

This analog has been in use for the past year both for a general study of compressor-piping design methods and for the design of piping for specific compressor stations. To date, it has been used for the design of piping at 12 compressor stations operated by 9 of the 16 operating companies sponsoring the analog development.

The S.G.A. Compressor Station Analog

The analog developed for the S.G.A. is not a computer in the sense that one usually thinks of a computer; it does not solve an equation for a specific set of operating conditions as does a differential analyzer or digital computer. Instead, it is an electrical model of the compressor and its suction and discharge piping. Every electrical element in the analog corresponds directly to a mechanical element in the compressor system. Measurements of electrical occurrences which result from using the compressor analog to pump electrical charge through the piping analog are equivalent to field measurements which would be made at a compressor station. In other words, there is a one-to-one correspondence between the electrical components of the analog and the mechanical components of the compressor installation, and between the electrical variables (voltage, current, frequency, etc.) and the operating variables at the station (pressure, flow, r.p.m., etc.).

Construction . . . The analog is built so that any important mechanical quantity in the compressor or piping can be varied individually. For example, the clearance volume of a single cylinder is changed by exchanging small plug-in units; other plug-in units change the length or diameter of a pipe by any chosen amount; changing of dial setting varies the crank-angle spacing of pistons; the compression ratio can be set by changing another dial setting, and the like.

By such simple and rapid changes, it is possible to duplicate the compressor speed, piston stroke, pocket action, valve action, etc., and study the effects of any such changes individually. Instrumentation permits measurement of pulsation amplitudes, mass flow, and the like at any point in the piping as well as cylinder pressure and cylinder volume.

Fig. 1 shows the analog set up for a study of a specific compressor installation.

What the analog does . . . Measurements made with the analog permit evaluating compressor performance and determining pulsation conditions in the piping for a given piping configuration and any range of operating conditions specified. The choice of piping design must be based on engineering principles; the analog only permits observing the effects produced by operation of the compressor with a specific pipe configuration. It does not predict changes in piping necessary to eliminate the cause of any undesirable effects.

However, the measurements very clearly point out the nature of any difficulty, locate the difficulty as to position in the system, and relate it accurately as to its cause. Therefore, it makes possible an intelligent use of engineering principles to achieve desired operating characteristics of the installation.

All measurements made on the analog can be converted directly to an equivalent field measurement by use of a conversion factor. For example, voltage is converted to pressure in pounds per square inch by multiplying the measured voltage by a constant. The measurements that can be made with the analog, expressed in terms of the equivalent field measurement, are; (1) static pressure, (2) peak-to-peak or average pulsation pressures, (3) average mass flow, (4) peak-to-peak or average mass-flow variations, and (5) pulsation frequency.

In addition, it is possible to see the shape of the pulsation pressure waves at any point in the piping and the pressure-volume or pressure-crank angle relations in the cylinder; these curves are presented instantaneously on the face of a cathode-ray tube. They may be photographed in about 1 minute with a Polaroid camera.

Use of the Analog for Piping Design

One measurement which can be made easily and quickly with the analog is a determination of the pressure-transmission ratio, or frequency-

response, curve for a set of piping. This curve indicates the amount of transmission of each frequency by the piping. It provides a direct measurement of the cutoff frequency and the limits of all pass bands for a set of piping. The curve is automatically traced by instrumentation included with the analog; and is recorded with a Polaroid camera. The effects of expansion ratio, the location of pipe junctions, and viscous damping are reflected in the transmission curve.

Further, it includes the effect of all the piping. A curve obtained from formulas neglects the presence of laterals, headers, bypass piping, etc., which have a definite effect on the transmission curve, the analog also takes into account the point at which pulsations are created by allowing the dampener to be excited at the nozzle locations; whereas the formulas compute only the case where the piping is excited at one end. The use of these curves in dampener design is demonstrated by the curves shown in Fig. 2 and Fig. 3.

Fig. 2 shows the transmission curves as presented on the screen of the cathode-ray tube when a set of suction piping was excited at each of the three nozzle locations. These curves are for a specific compressor installation where the piping had been designed by using the "cutoff frequency formula." They show that actual cutoff (transmission of less than 10 per cent of the input) is not reached anywhere in the zero to 100-c.p.s. range covered by the curves, and that the transmission curves vary significantly with the point of excitation.

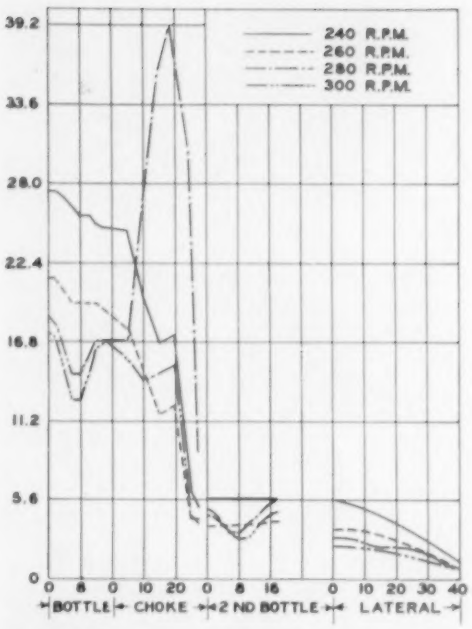
Fig. 3 is a tracing of three photographs of curves on the cathode-ray tube. Curve A of Fig. 3 is the transmission curve for a set of discharge piping which includes a section of bypass piping. Curve B shows the transmission curve obtained when the bypass piping is omitted. These curves show the importance of including all the piping when obtaining a transmission curve. Curve C of Fig. 3 shows the transmission curve for a dampener designed with the analog where it was desired to eliminate all frequency pass bands above a specified cutoff frequency. Note that these bands do not appear on the analog transmission curve.

Since the various parts of the piping can be varied in length, the location of pipe junctions, and the elimination of certain piping components can be done quickly on the analog by changing electrical connections or by adding or removing plugin units. Since the frequency transmission curves for any configuration can be seen at once on the cathode-ray tube, the cause of the high transmission ratio for any frequency or set of frequencies can be determined readily. Means of reducing the transmission to an acceptable value can be determined rapidly by experimentation with the analog.

Measurement of pulsation level . . . The transmission curve for the piping is an important tool used in determining pulsation conditions at a given compressor station and in designing piping with improved transmission characteristics. However, it does not furnish the information that the designer really wants to know. The transmission curve only shows the ratio of dampener output to dampener input for a given frequency of pulsation. It does not give any indication of what the pulsation conditions are either inside or outside the dampener. It does not show how these conditions change with compression ratio, compressor speed, pocket setting, and the like.

If a dampener with a transmission characteristic like that in curve C of Fig. 3 is installed between a compressor and the header, it is certain that the pulsations will not be transmitted to the header with any appreciable amplitude; however, it is not at all certain that the pulsations inside the dampener itself will not be extremely high in amplitude. In preventing the transmission of pulsations, the dampener must intermittently store and release the pulsations from the compressor so that essentially smooth flow results downstream from the dampener. With improper design, this storage and release of pulsation energy can result in damaging pulsations within the dampener. This point is amply demonstrated by the four curves of Fig. 4. These show pulsation levels at points inside the dampener. (See transmission characteristics, Curve C, Fig. 3.)

By comparing input to output amplitudes in Fig. 4 it is obvious that pulsations of all frequencies are almost completely damped out. However, the curves of Fig. 4 show at least five cases of severe resonance within the dampener in the speed range from 240 to 310 r.p.m. wherein pulsation amplitudes from approximately 17 to 40 psi. will exist at some point in the dampener. Since a pulsation resonance gives rise to unbalanced forces in the piping whereas the forces caused by nonresonant pulsations usually balance out, it is very important that resonant conditions be detected.



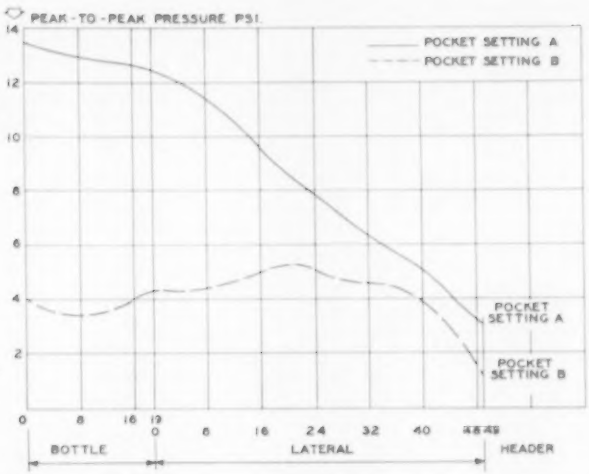
PULSATION LEVELS inside a double expansion chamber dampener at four values of r.p.m. show five cases of pipe resonance. Fig. 4.

It is also interesting to point out that (1) had the transmission curve for this dampener been computed by the Cos W method, it would have been grossly in error (by predicting pass bands that do not exist), (2) had the more accurate N.A.C.A. method been used, it would have required one man at least a month to complete the computations, and (3) once having the accurate transmission ratio curve, it does not provide any information regarding the excessive pulsation amplitudes within the dampener.

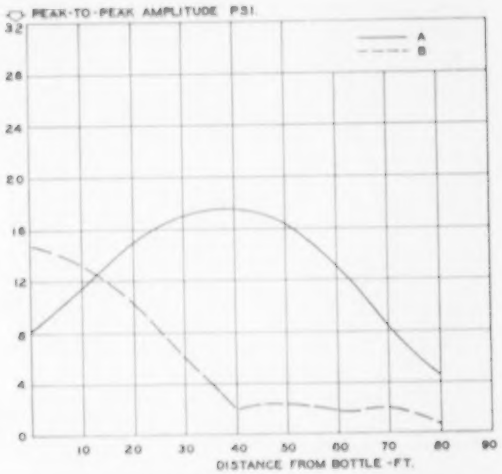
The use of the analog makes it possible to survey the pulsation amplitudes and frequencies throughout the piping system and to control the location of pulsations at points in the piping where the piping can be adequately secured to prevent excessive vibration. Further, it permits these surveys to be made under any combination of operating conditions likely for the station.

For example: Fig. 5 shows the variation in pulsation level in a set of discharge piping consisting of a single expansion bottle and lateral between the compressor and the station header for two different pocket settings on an Ingersoll-Rand Type 412 KVS-1 compressor. The curves show that peak-to-peak pulsation pressure in pounds per square inch throughout the 19-ft.-long bottle and the 49-ft.-long lateral which are joined end to end.

Fig. 6 shows two curves of pulsation level along an 80-ft. lateral joining an expansion bottle to the station header. Where the piping is being driven by a Cooper-Bessemer GMWA-



HOW POCKET SETTINGS AFFECT pulsation level is shown by this curve of pulsation level versus position in a single expansion bottle discharge system. Fig. 5.



SEVERE RESONANCE in an 80-ft. discharge lateral, Curve A, was eliminated by adding resonator in center of lateral, Curve B. Fig. 6.

10 operating at 250 r.p.m. Curve A shows a high pulsation level exists because of resonance of the lateral. Curve B shows how this resonance was destroyed and the over-all pulsation reduced by placing a resonator in the center of the lateral.

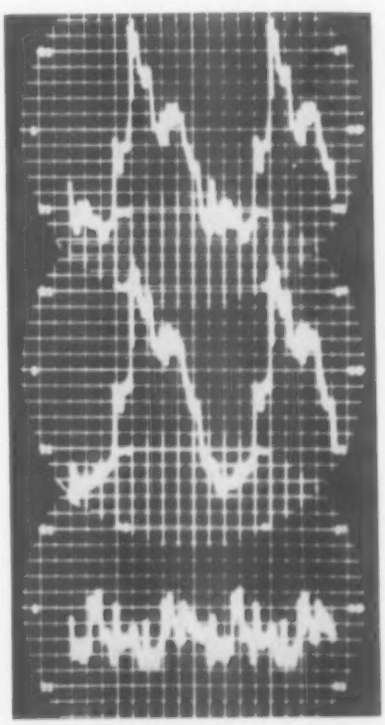
Pulsation wave forms . . . Other information obtained easily from the analog is the shape of the pulsation wave form at any point in the piping. The curves are seen on the cathode ray tube and correspond directly to the pressure records usually made in field tests with a pressure pickup and a chart recorder.

A series of such curves are shown in Fig. 7 as they appear on the cathode-ray tube. The curves shown are the pulsation pressure wave forms as they appear in the No. 4 nozzle of an Ingersoll-Rand Type 412 KVS-1 feeding a double expansion-chamber dampener for three different pocket settings.

A direct measurement of the pulsation amplitude can be made from the curves. The predominant frequencies appearing at that point in the piping can be determined approximately by observation since the grid lines on the tube are calibrated as to pressure amplitude and frequency. This set of three curves shows almost a four to one change in pulsation amplitude with different pocket settings at the same crankshaft speed and compression ratio, and for the same piping configuration.

Standing wave patterns . . . The presence of standing waves with significant amplitudes can usually be observed in diagrams of pulsation level vs. position in the piping of the type shown in Figs. 5 and 6. Having determined that standing waves will occur in the piping when driven by the compressor at one or more crankshaft speeds, the actual standing wave pattern corresponding to any one of the standing wave frequencies can be traced throughout the piping. This is done by feeding the piping at different nozzle locations with a sine wave of the standing wave frequency and measuring the amplitude of the sine wave at intervals along the piping.

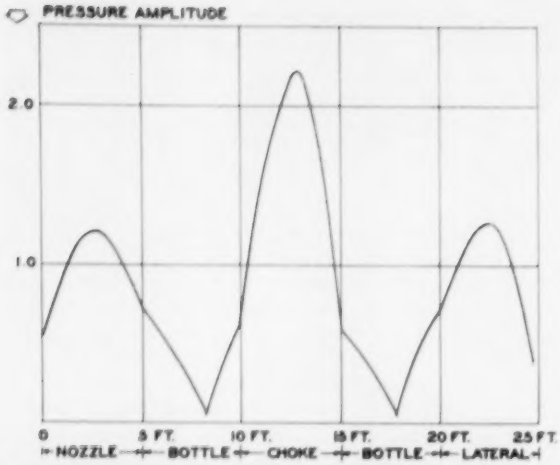
Fig. 8 shows a standing wave pattern in a double expansion-chamber dampener with a single nozzle and a lateral wherein the nozzle, lateral, choke, and both bottles are the same length. The wave pattern corresponds to fundamental resonance of the system and the pattern shows almost 100 per cent transmission of this frequency even though it is well above the cutoff frequency computed by the cutoff formula.



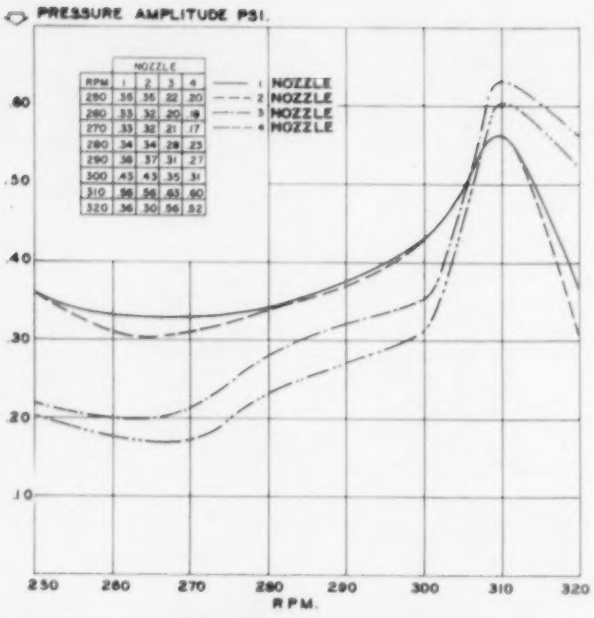
OSCILLOGRAMS show change in pulsation amplitude and waveform in nozzle for three different pocket settings. Note doubling of basic frequency and lower amplitude in bottom oscillogram. Fig. 7.

Nozzle pulsation pressure level . . . Measuring pulsation amplitude in the nozzles as r.p.m. is varied from minimum to maximum is often important in diagnosing the source of pulsation trouble. Such a curve will indicate the crankshaft speeds at which resonance occurs at a piping location where it can feed back into the compressor cylinders and cause overload. Measurement of the level is made directly on the analog while r.p.m. is changed continuously by varying a dial setting. A series of such curves are shown in Fig. 9 wherein the pressure in each of four nozzles is plotted vs. crankshaft speed. Note that severe resonance with resultant feedback into the cylinders in indicated in the vicinity of 310 r.p.m.

Cylinder load and volumetric efficiency . . . The cylinder load and mass flow per revolution may be determined for different operating conditions with the analog. Through analog studies, piping can be designed which matches the compressor to its load for the entire speed range of the compressor. Then, mass flow increases linearly with r.p.m. while cylinder loading remains constant. Further, these objectives can be realized while maintaining good pulsation-damping characteristics. For in-



STANDING WAVE PATTERN in a symmetrical double expansion chamber dampener at fundamental resonant frequency of all components. Fig. 8.



CURVES OF NOZZLE PRESSURE versus crankshaft speed show severe resonance near 310 r.p.m. Fig. 9.

stallations having adequate surge volume for the compressor, analog studies conducted have shown that cylinder overloads occur at certain speeds because of feedback of dynamic pressure into the cylinder during the time the valve is open. These studies have shown excellent correlation with field measurements of the same installation made with the M.I.T. engine indicator.

In this type of study, cylinder pressure vs. cylinder volume curves are presented directly on the cathode-ray tube of the analog. Also, the curves can be presented in the form of cylinder pressure vs. crank angle as normally obtained with the M.I.T. indicator. By measuring the area of the cylinder PV curves, variations in the loading of any cylinder for any combination of speed, compression ratio, and pocket settings can be determined. Further, each of these variables can be changed independently of the others. This is seldom possible in making field measurements.

Fig. 10 shows the PV diagrams as shown on the cathode-ray tube for three combinations of pocket settings. Fig. 11 shows the pressure vs. crank angle diagrams for the same set of conditions as Fig. 10. Compressor speed and compression ratio were maintained constant for all diagrams shown.

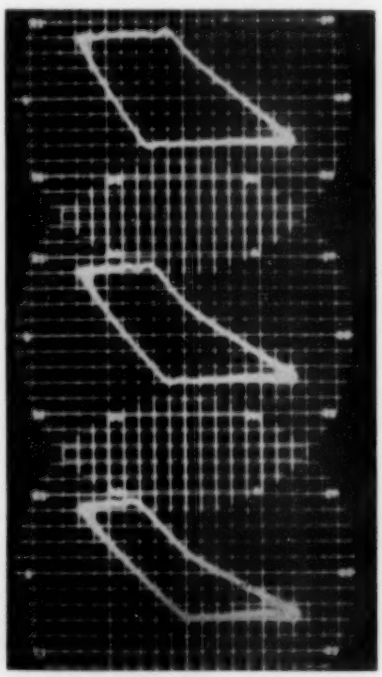
Conclusion

The Southern Gas Association and Southwest Research Institute have had about 9 months' experience using the analog computer in solving pulsation and piping problems relating to existing stations and in designing new installations. The compressor units have ranged from single-cylinder single-acting to six-cylinder double-acting. The piping has ranged from a simple straight lateral to the most advanced type of filter design.

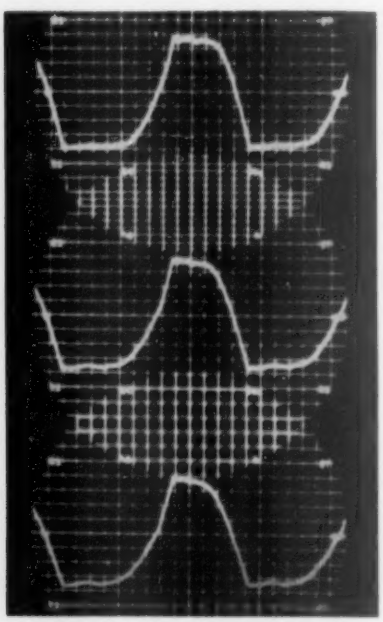
This experience and actual results have proved the analog computer to be the most advanced, effective, economical, and rapid way to design compressor piping for maximum pulsation control and compressor efficiency.

Acknowledgment

The authors wish to thank members of the S.G.A. Pulsation Research Council, the staff of Sw.R.I. who have worked on this problem, and numerous individuals outside the Pulsation Council who have contributed knowledge, time, and skills leading to development of the analog and who have helped accumulate material used in this article.

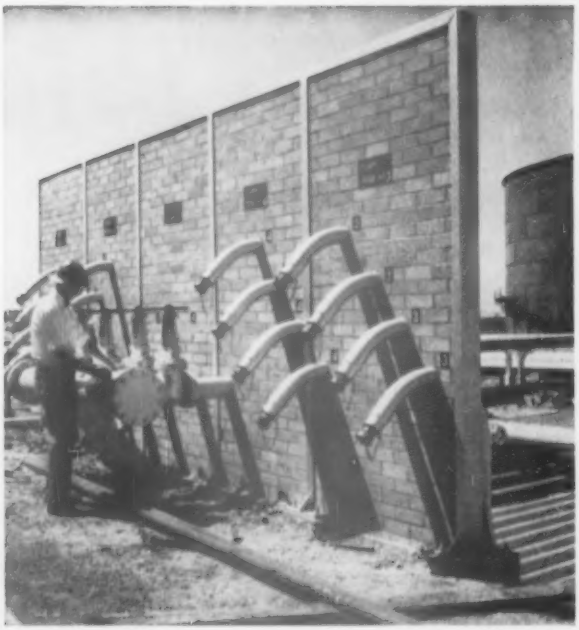


CYLINDER PRESSURE versus cylinder volume curves change in area and shape as pocket is opened to increase clearance volume. Fig. 10.



CYLINDER PRESSURE versus crank angle curves showing changes in shape of curve and time of valve operation as clearance volume is increased by changing pocket setting. Fig. 11.

WELDING IN PROGRESS on Shell's 36-mile products pipeline between Geelong refinery and Melbourne, Victoria.



FOAM AND WATER SPRAY connections to crude-oil tanks. Fire-fighting apparatus hooks up directly to these connections.

AUSTRALIA'S FIRST POSTWAR REFINERY

Shell's Geelong Plant Started From Scratch

Middle East and Borneo crude is feed stock for this 32,000-bbl.-daily installation

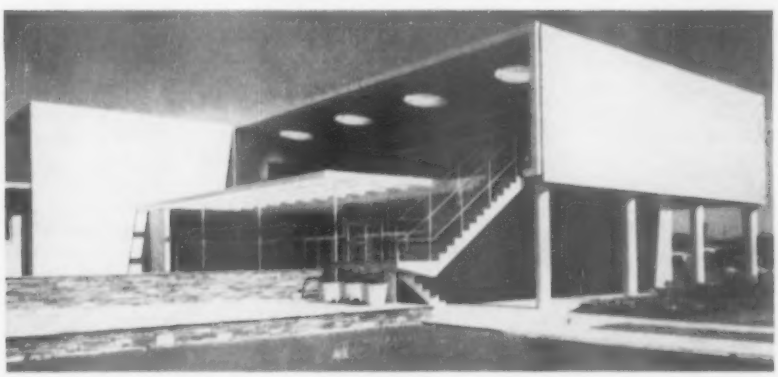
AUSTRALIA'S oil industry started to cut its teeth in the twenties. It is being nursed to virile manhood now with a 240-million-dollar development program backed by the world's oil companies.

Since the World War II the consumption of oil products in Australia has steadily grown. For instance, gasoline consumption was 26,300 bbl. per day in 1948. Last year the figure was doubled to 52,400 bbl. per day. The consumption figure this year is expected to rise to 56,500 bbl. per day.

Potentially the partly developed land that has already acquired a petroleum palate is a glutton for oil and its by-products.

Millions of dollars worth of British and American finance has been spent on a so far unsuccessful search for commercial oil deposits in Australia. In the meantime, extensive refinery facilities are being built to meet the ever-growing home market.

REFINING



AMENITIES AND RECREATION BUILDING built for the benefit of the Geelong refinery staff.

First postwar unit . . . The first of Australia's new chain of postwar refineries to come into operation is that of the Shell Group. Situated near Geelong, the new 55-million-dollar venture is located on the shore of Corio Bay, in the southern State of Victoria. It is an expansion of Shell's Australian refining activities which, since 1928, have been concentrated at Clyde, New South Wales.

Fed direct by ocean-going tanker with crude oil from British Borneo and the Middle East, Shell's Geelong refinery provides high-quality gasoline, diesel fuel, and fuel oil for the Australian, New Zealand, and Malayan market.

It handles 32,600 bbl. of crude oil

per day. Output figures are gasoline, 9,600 bbl. daily; diesel fuel, 7,800 bbl. daily; and fuel oil, 7,800 bbl. daily.

Unlike most refineries that have been built up gradually as market demands have grown, Geelong has been developed from a virgin site of 270 acres.

First step was the building of 3½ miles of roads to open up the area. Eventually the refinery will be served by 7 miles of sealed roadway.

Processing . . . The refinery plant consists of two crude-oil distillation units, a feed-preparation unit, and a cat cracker with ancillary treating units. A platformer and polymerization unit to produce more high-quality gasoline are now in course of construction.

Both crude-distillation units, although capable of independent operation, are located in the one plot. The layout is most satisfactory from the utilities supply and the operational control points of view.

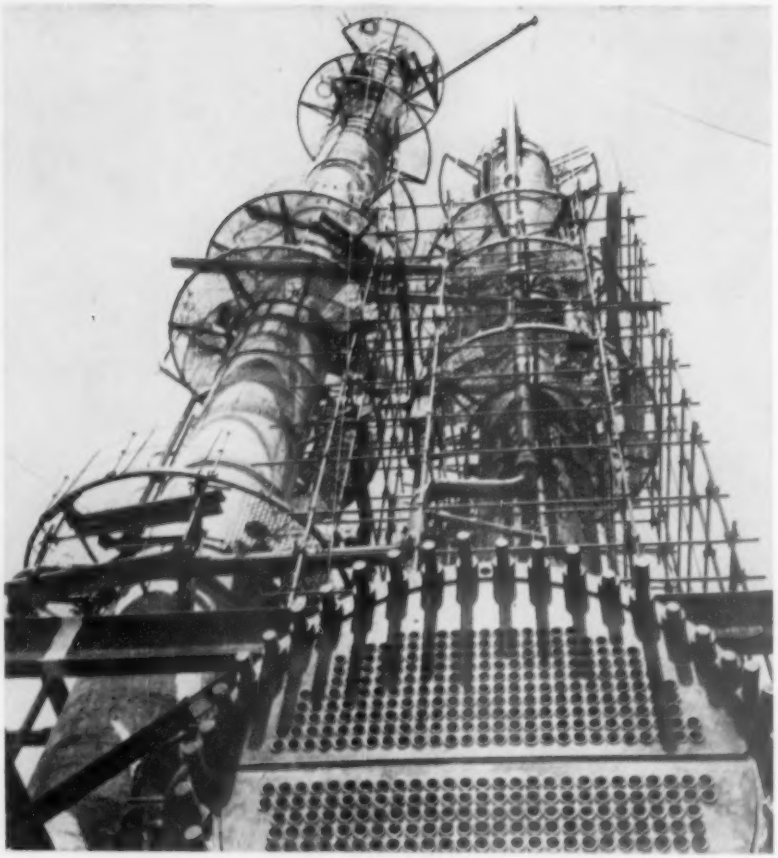
Each plant is of conventional design and comprises two main fractionating columns with bubble-cap trays, side-stream strippers, and the usual heat exchangers, condensers, and pumps. Heat is applied to the process by means of oil and gas-fired furnaces.

Products line . . . A finished-products pipeline has been constructed from the refinery to the Shell Melbourne metropolitan distribution center at Newport, 36 miles away. The oil pipeline is the longest in Australia and cost the equivalent of 1 million dollars. It carries gasoline and diesel fuel, and has a capacity of 43 million barrels of products a day.

The 8-in.-diameter steel pipe is wrapped in glass fiber and coated with bitumen and enamel. It is buried 3 ft. under ground. A 20-lb. block of magnesium has been placed every 1,000 ft. for corrosion protection. Products are pumped through it at the rate of 670 to 810 bbl. per hour. The pump delivers 400 psi. pressure at the Geelong entrance. No boosters are used.

Welded storage tanks for crude oil and finished products with a total capacity of 87,600,000 gal. have been erected on the site. Tank foundations consist of a consolidated 10-in. thickness of granitic sand surfaced with 2 in. of an asphalt-sand mix. Foundations have presented few problems as the natural ground has a good bearing capacity. The ground is well-compacted yellow clay mixed with partially decomposed limestone.

The coming of the refinery to Corio Bay has been a boon to the Geelong Harbor Trust—controllers of Corio Bay. The trust collects the equivalent of 1 million dollars from Shell refinery each year with landing dues. The trust has built a pier for discharging and backloading tankers which is 3,000 ft. long, and is capable of handling two tankers at the same time. Dredging to 32 ft. was needed to allow 18,000-ton general-purpose tankers to operate in the area.



GAS PLANT for catalytic cracking unit. Shown are absorber and stabilizer with its reboiler.

Cooling water . . . Cooling of oil and equipment is a vital refinery aspect. Shell's Geelong refinery has a salt-water intake channel which draws 3,800,000 gal. of water an hour from Corio Bay for this purpose. The mouth of the intake is 7 ft. below sea level at low tide.

Before the salt water passes into the main suction race leading to the pump house it is passed through rotary screens to remove seaweed and debris. It is then dosed with chlorine so that microorganism growth will not foul the condensers.

After use in the refinery, the water passes underground to interceptors where it is cleaned of any oil before it is passed back into Corio Bay.

The refinery has its own powerhouse that can at present produce a maximum output of 9,000 kw. Three turbogenerators, each of 3,000 kw. capacity have been installed, and plans are in hand for installation of a fourth unit of the same type.

Laboratory . . . The project is also equipped with a modern laboratory whose main work is control of plant operations and finished-product testing.

Apparatus and equipment used range from simple though modern distillation units to large intricate assemblies such as C.F.R. engines to test the antiknock qualities of fuels, and the Podbielniak "Hyrobot," for low-temperature fractional distillation of gases.

An amenities building of most advanced design has been built that has become a center of interest among Australia's industrialists. It includes a large recreation room and sun balcony, glass-enclosed dining halls, a library, and a kiosk. The change rooms are fitted with circular-spraying wash fountains and the building is decorated.

Nearly 2,000 men of 14 nationalities have worked together happily during the building of the refinery. Many of them have been Dutchmen attached to Werkspoor N.V., and the Dutch Australian Contracting Co. Pty., Ltd.

The permanent Shell staff, as distinct from the construction staff, is 800.

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—38

Quick Quiz on Mechanical Seal Construction

Q. How is the stationary part sealed to the unit?

A. The same rules apply as for rotating parts. Either press fittings or loose fit with packing can be used. If the stationary member must move axially, it must be sealed to its adjacent stationary member by a packing.

Q. How many kinds of packing are available for this service?

A. Packing shapes include: V packings; O rings; square sections; and U packings. All shapes are not available or practical in all packing materials.

Q. How do extreme operating conditions affect seal design?

A. Material selection is the most important factor in meeting operating conditions. This is particularly true of the packing component. Even an application where temperatures, etc., allow the use of rubber, the compounding of the rubber must be correct for the type of fluid being sealed. When corrosive fluids are involved, not only must the packing be of suitable material, but also the metallic components must be of materials that will resist the corrosive action of the fluid.

Design modification as well as material selection come into the picture when high speed, high temperature, or high pressure are factors. The following are typical:

. . . High speed. Ultra-low-friction face materials, minimum face pressures, minimum mass in axially moving ring, ultra true running of rotating surface.

. . . High temperature. Temperature-resistant packing, minimum face pressure, low-expansion metals in carbon-face holding ring.

. . . High pressure. High-pressure packing shape, minimum clearances in packing cavity, greater strength in parts subjected to high pressure.

Materials Used in Seal Construction

Q. What basic materials are used in seal construction?

A. Metals, carbons, rubbers, ceramics, and plastics.

Q. To which seal components do these materials apply?

A. Metals are used quite universally in seal components and some seals are entirely metallic. Most seals, however, utilize metals chiefly as: (1) carrying members for wear faces; (2) enclosures or housings; (3) springs; and (4) wear faces.

Carbons are used as wear surfaces (seal faces). Rubbers are used to seal one component to another (packings). Ceramics are used as wear surfaces (seal faces). Plastics are used both as seal faces and to seal one component to another (packings).

Q. What variety of metal types is used?

A. Metals used as carrying members for wear faces or as enclosures have only the requirement of compatibility with the material being sealed and the temperature of operation. For instance, if a corrosive fluid is being handled, the metal coming in contact with the fluid must be capable of resisting this corrosive action. Regardless of the metal choice, the machinability of the material must always be considered.

Metals used as springs must be of a nature that will result in adequate spring characteristics when suitably treated and, when necessary, be corrosion and/or heat resistant.

Metals used as seal faces must have low friction and abrasion characteristics.

Q. What specific types of metal are used?

A. In the "stainless" category, Types 302, 303, 316, 410, 440, etc.; in the highly corrosion-resistant category, Hastelloys, Duromet, etc.; in the low-expansion materials — Carpenter 42, Invar, Kovar, etc.

In the wear-face category: 303, 440, low-carbon steel, case-hardened, hardened tool steel, cast iron, high-lead bronzes, stellite, and tungsten carbide.

In the spring category: 302, carbon steel, Z nickel, Carpenter 20, Hastelloy, Inconel, phosphor bronze, and beryllium copper.

Q. What types of carbons are used and why?

A. There is a wide variety of carbon materials. Many of them are unsuited for seal use, others are suitable to limited degree. The desirable qualities of carbon for seal use are low friction and controlled porosity. Many low-friction carbons have a degree of porosity that makes them unsuitable for applications involving fluids under pressure. Carbon, such as used for seals, is extremely porous as molded.

Various methods are employed by the carbon manufacture to "fill" these pores. These methods range through wax and resin impregnation to metal impregnation. Another method is to repeatedly impregnate with a pitch-like material and then "graphitize" this impregnant until porosity has ceased to exist.

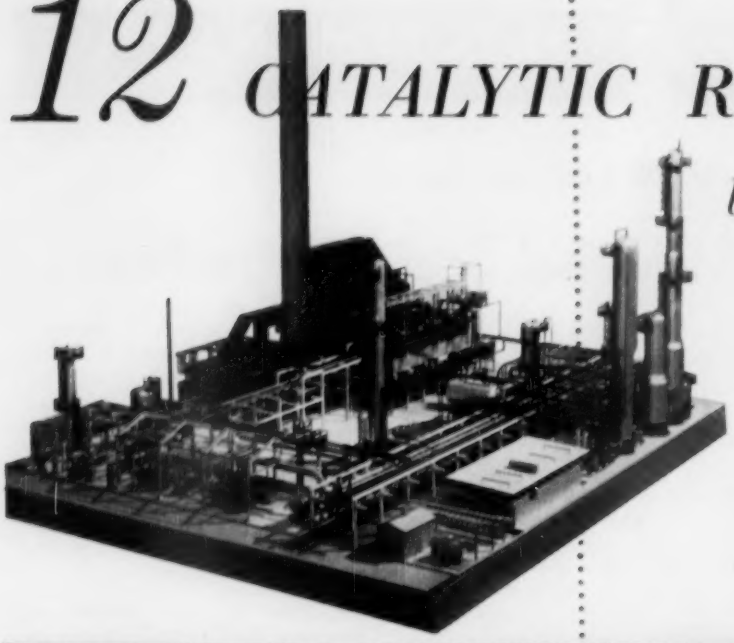
Metal impregnants are reputed to impart low friction characteristics as well as reduce porosity. Metal impregnants include babbit, bronze, cadmium, copper, and silver.

The selection of the basic carbon powder is of great importance. Dependence must be placed on the manufacturer for consistent quality once a carbon type has been tested out as satisfactory.

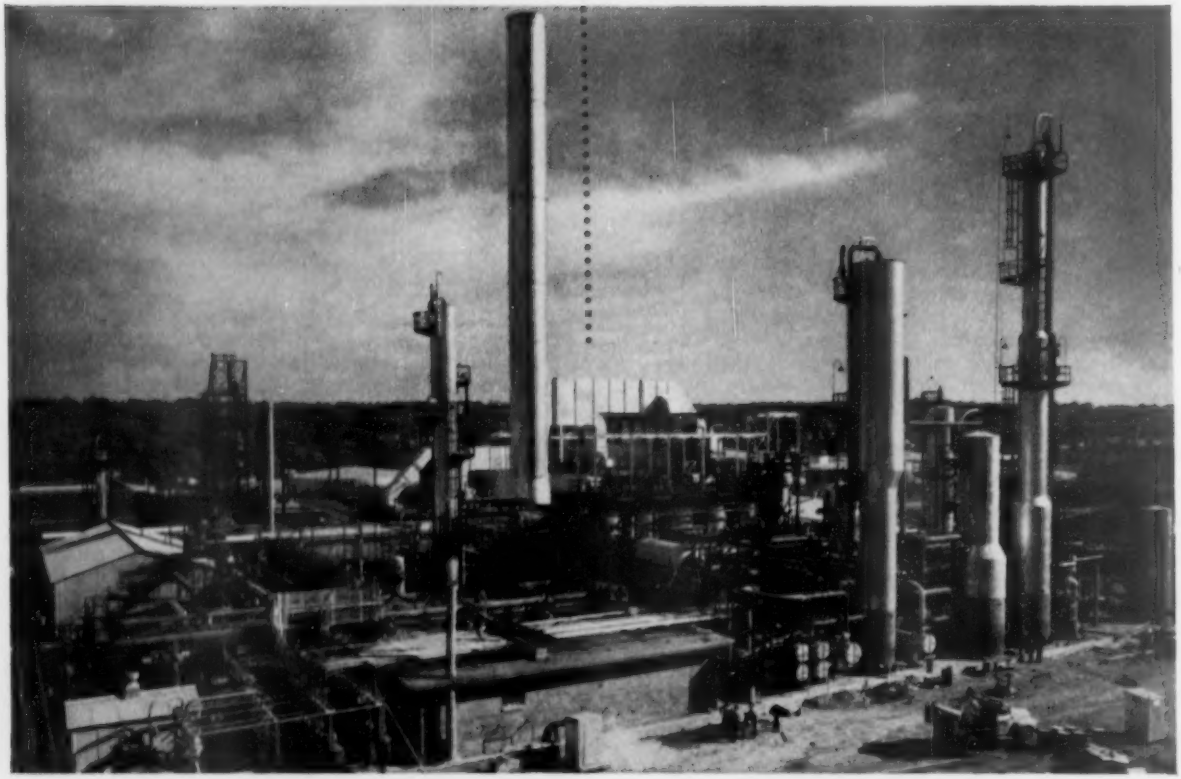
It has been well established that a carbon type that will run well against another material (nitralloy for instance) will not necessarily do well against a mating surface of a different type.

12 CATALYTIC REFORMERS

by PARSONS



Contracts for twelve catalytic reformers have been awarded to Parsons. These plants range in capacity from 600 to 17,000 barrels per day and include regenerative and non-regenerative units using four different platinum-type catalysts. Process design, engineering, procurement, and construction of these catalytic reformers are by Parsons.



THE RALPH M. PARSONS COMPANY

NEW YORK
PASADENA
WASHINGTON

ENGINEERS · CONSTRUCTORS

617 South Olive Street, Los Angeles 14, California

ANKARA
BAGHDAD
BEIRUT
KARACHI
NEW DELHI
PARIS

1955 Burner and Diesel-Fuel Survey

THE U. S. Bureau of Mines has issued two reports: (1) Burner Fuel Oils Survey, 1955, Bureau of Mines Information Circular 7730; and (2) Diesel Fuel Survey, 1955, Bureau of Mines I.C. 7737. The Burner Fuel Oils Survey is the first issued by the bureau for this type of fuel. The data has been summarized here for convenience. The table for Grade 2-D fuel (diesel oil with minimum pour point of 5° F.) has been omitted here—see I.C. 7737.

Diesel fuel survey reports, conducted under a cooperative agreement between the A.P.I. and the Bureau of Mines, have been published annually since 1950. The new survey of burner fuel oils is similar to the diesel fuel surveys in pattern and has been conducted under an extension of the same agreement at the request of the Oil Heat Institute of America and the petroleum industry. It is not intended to conflict with the diesel fuel survey but rather to supplement it.

Burner fuel oils are also specifically referred to as heating oil, range oil, furnace oil, "Bunker C," and fuel oil. Sales of all grades of fuel oil in the United States have increased from 340 million barrels in 1926 to over a billion barrels per year.[1]

It must be realized that the data given are not accurate indications of the use of these materials as burner fuels. Some burner fuel, used as range oil, is kerosine—which is not included above. A large volume of fuel oil—about 30 per cent of the distillate type and some residual fuel oil—is sold as diesel fuel. Smaller amounts, particularly of the light distillate oil, also are prepared for use as spray oils (insecticides), smudge-pot fuel, adsorption oil, and some as components of jet fuel.

Reference

1. Coumbe, A. T., and Avery, L. F., Sales of Fuel Oil and Kerosine in 1954: Distillate and Kerosine Sales Increase, Residual Grades Decline; Bureau of Mines Mineral Report 2412, 1955, 16 pp.

TABLE 1—SUMMARY OF GRADE 1 FUELS, BURNER-FUEL OIL SURVEY, 1955

Geographic distribution of burner-fuel oils		Eastern region	Southern region	Central region	Rocky Mountain region	Western region
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	43.6	42.7	42.3	42.3	38.5
Viscosity						
Kinematic at 100° F., centistokes	D445	1.64	1.72	1.79	1.67	1.89
Sulfur content, wt. per cent	D129	0.089	0.048	1.140	0.147	0.222
Aniline point °F.	D611	151.1	150	149.6	145.9	139.4
Ramsbottom carbon residue on 10 per cent residuum	D524	0.059	0.051	0.067	0.056	0.075
Ash, per cent	D482	0.000	0.000	0.000	0.000	0.000
Water and sediment, vol. per cent	D96	0.00	0.00	0.00	0.00	0.00
Distillation test,						
on volume recovered basis:	D86					
Initial boiling point °F.		341	345	347	349	350
10 per cent		376	379	385	385	399
50 per cent		424	427	437	431	447
90 per cent		488	492	506	495	508
End point		531	527	458	545	553

TABLE 2—SUMMARY OF GRADE 2 FUELS, BURNER-FUEL OIL SURVEY, 1955

Geographic distribution of burner-fuel oils		Eastern region	Southern region	Central region	Rocky Mountain region	Western region
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	35.9	34.8	35.4	35.9	34.1
Viscosity						
Kinematic at 100° F., centistokes	D445	2.61	2.44	2.54	2.55	2.97
Sulfur content, wt. per cent	D129	0.325	0.339	0.330	0.443	0.471
Aniline point, °F.	D611	145.4	139.1	140.1	139.4	139.4
Ramsbottom carbon residue on 10 per cent residuum	D524	0.115	0.123	0.122	0.098	0.097
Ash, per cent	D482	0.001	0.003	0.001	0.000	0.000
Water and sediment, vol. per cent	D96	0.00	0.00	0.00	0.00	0.00
Distillation test,						
on volume recovered basis:	D158					
Initial boiling point, °F.		355	340	358	371	375
10 per cent		425	415	424	432	439
50 per cent		501	499	502	495	504
90 per cent		584	587	578	567	582
End point		638	640	625	617	636

TABLE 3—SUMMARY OF GRADE 4 FUELS, BURNER-FUEL OIL SURVEY, 1955

Geographic distribution of burner-fuel oils		Eastern region	Southern region	Central region	Rocky Mountain region	Western region
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	22.1	20.8	18.7	26.0	23.2
Viscosity						
Kinematic at 100° F., centistokes	D445	17.20	13.9	17.9	16.1	16.4
Cloud test, °F.	D97				†10	†10
Pour point, °F.	D97					
Sulfur content, wt. per cent	D129	0.826	0.50	1.45	1.74	2.12
Aniline point, °F.	D611	‡	†163		†142	†142
Ramsbottom carbon residue on 100 per cent sample; per cent	D524	3.11	1.61	5.95	3.40	2.99
Ash, per cent	D482	0.012	0.002	0.011	0.010	0.010
Water and sediment, vol. per cent	D96	0.15	Trace	0.30	0.05	0.03
Distillation test,						
on volume recovered basis:	D158					
Initial boiling point, °F.		‡	†382		‡	†504
10 per cent			500			534
50 per cent			610			570
50 per cent			700			630
End point			760			686

(Continued on Next Page)

TABLE 4—SUMMARY OF GRADE 5 FUELS, BURNER-FUEL OIL SURVEY, 1955

Geographic distribution of burner-fuel oils		Eastern region	Southern region	Central region	Rocky Mountain region	Western region
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	15.2	16.4	13.1	11.0	14.3
Viscosity						
Kinematic at 100° F., centistokes	D445	73.2	71.6	76.9	‡	‡
Furol at 122° F., seconds	D88	24.6	24	24.4	30.1	32.5
Pour point, °F.	D97					
Sulfur content, wt. per cent	D129	0.96	1.67	1.39	2.38	1.97
Ramsbottom carbon residue on 100 per cent sample, per cent	D524	5.98	5.55	7.43	5.57	8.34
Ash, per cent	D482	0.024	0.039	0.044	0.025	0.037
Water and sediment, vol. per cent	D96	0.33	0.30	0.25	0.13	0.13

TABLE 5—SUMMARY OF GRADE 6 FUELS, BURNER-FUEL OIL SURVEY, 1955

Geographic distribution of burner-fuel oils		Eastern region	Southern region	Central region	Rocky Mountain region	Western region
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	11.8	10.6	10.3	10.0	9.9
Viscosity						
Furol at 122° F., seconds	D88	169.9	165.3	195.3	167.7	148.9
Pour point, °F.	D97					
Sulfur content, wt. per cent	D129	1.44	1.55	1.38	2.14	1.97
Ramsbottom carbon residue on 100 per cent sample, per cent	D524	10.19	10.86	12.41	10.40	12.91
Ash, per cent	D482	0.044	0.076	0.150	0.055	0.051
Water and sediment, vol. per cent	D96	0.29	0.283	0.32	0.42	0.20

†Result of test on one sample only.
‡No average was determined as an insufficient number of samples was represented.

TABLE 1—SUMMARY OF GRADE 1-D FUELS—DIESEL-FUEL SURVEY, 1955, BY REGIONS

Geographic distribution of diesel fuels		Eastern	Southern	Central	Rocky Mountain	Western
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	40.9	30.5	39.9	40.5	40.9
Viscosity at 100° F.:						
Kinematic, centistokes	D445	2.02	1.96	2.18	2.15	1.96
Saybolt Universal seconds	D88	32.7	32.5	33.3	33.2	32.5
Sulfur content, per cent	D129	0.127	0.115	0.176	0.196	0.198
Aniline point, °F.	D611	140.4	147.8	148.8	150.1	149.4
Ramsbottom carbon residue on 10 per cent residuum per cent	D524	0.074	0.065	0.079	0.070	0.061
Ash per cent	D482	0.000	0.000	0.000	0.000	0.001
Cetane number	D613	51.3	50.0	50.9	51.1	49.0
Calculated cetane index	D975	50.4	48.7	49.8	50.2	49.0
Distillation test, on volume recovered basis:	D86					
Initial boiling point, °F.		356	355	362	365	361
10 per cent		401	399	407	409	403
50 per cent		454	451	464	460	448
90 per cent		521	517	532	524	504
End point		567	557	575	570	548

TABLE 2—SUMMARY OF GRADE 2-D FUELS WITH MAXIMUM POUR POINT 0° F.—DIESEL FUEL SURVEY, 1955, BY REGIONS

Geographic distribution of diesel fuels		Eastern	Southern	Central	Rocky Mountain	Western
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	36.3	35.3	36.1	35.8	33.7
Viscosity at 100° F.:						
Kinematic, centistokes	D445	2.74	2.93	2.95	2.86	3.10
Saybolt Universal seconds	D88	35.2	35.8	35.9	35.6	36.4
Sulfur content, per cent	D129	0.275	0.297	0.293	0.467	0.533
Aniline point, °F.	D611	147.6	146.4	150.2	144.9	138.8
Ramsbottom carbon residue on 10 per cent residuum per cent	D524	0.113	0.109	0.110	0.092	0.105
Ash per cent	D482	0.001	0.001	0.001	0.002	0.001
Cetane number	D613	50.5	50.3	50.9	49.8	45.4
Calculated cetane index	D975	50.4	49.5	51.5	49.5	46.2
Distillation test, on volume recovered basis:	D158					
Initial boiling point, °F.		367	376	372	384	379
10 per cent		432	439	438	438	444
50 per cent		507	512	514	502	511
90 per cent		590	592	596	586	597
End point		646	650	652	648	663

TABLE 3—SUMMARY OF GRADE 4-D FUELS—DIESEL-FUEL SURVEY, 1955, BY REGIONS

Geographic distribution of diesel fuels		Eastern	Southern	Central	Rocky Mountain	Western
Test—	A.S.T.M.	average	average	average	average	average
Gravity, °A.P.I.	D287	27.3	29.1	24.2		20.6
Flash point, P.-M. closed tester °F.	D93			180		
Color:						
A.S.T.M. Union colorimeter	D155			(Black)		
Viscosity at 100° F.:						
Kinematic, centistokes	D445	15.94	11.77	18.72		42.7
Saybolt Universal seconds	D88	81.1	65.2	92.4		198.5
Pour point, °F.	D97			15		
Sulfur content, per cent	D129	0.577	0.416	0.820		1.31
Aniline point, °F.	D611	163.0	158.9			128.7
Ramsbottom carbon residue on 10 per cent residuum per cent on 100 per cent sample, per cent	D524	0.77	†0.12			
		1.48	0.72	3.72		4.12
Ash per cent	D482	0.015	0.003	0.082		0.018
Cetane number	D613	‡	42.3			†39.5
Calculated cetane index	D975	58.3	49.4			†38.0
Distillation test, on volume recovered basis:	D158					
Initial boiling point, °F.		398	402			383
10 per cent		500	499			464
50 per cent		622	625			605
90 per cent		728	(4)			†730
End point		773	†>760			†>760

†Result of test on one sample only. ‡Number averages determined; only two samples.

BE MODERN—BUY WILSON

Wilson RIGS

MEET YOUR NEED

WHATEVER YOUR REQUIREMENTS . . . THERE'S A WILSON RIG OF THE RIGHT SIZE AND TYPE FOR YOU!

Shown in the illustration is a new Wilson Giant Torcair drilling rig.

● The mast is Wilson's new Giant 126 foot postable drilling mast. It has a rated hook load capacity of 350,000 lbs. with 8 lines strung.

● One unique feature of this mast is that the ease of operation surpasses that of many smaller masts. Its erection is fully hydraulic, the same efficient system that is on the 96 foot Wilson production masts.

● The racking platform automatically folds out into working position at a desired height to accommodate the racking of trebles.

● The rig is a Wilson Giant Double Drum Torcair model powered by two WAKBU Waukesha engines with torque converters. It has an ample power capacity for efficient 8,000 foot work.

Wilson **WILSON MANUFACTURING CO., INC.**

WICHITA FALLS, TEXAS, U.S.A.

The Home of RED IRON

DEPTH, SIZE or TYPE

Photograph at right shows the location of driller's controls, mounted on hinged "Y" base of the mast. Extreme lower left of photo shows hydraulic controls for raising and telescoping mast operations.

Driller is located to have the best position possible for full view of work at all time.

Don't Go To Sleep When Selecting Power — by this we mean, don't make a final decision until you have considered ALL the factors — Capital Investment — Cost of Operation, namely maintenance, manpower, depreciation and FINAL COST. Many attempts have been made to generate Electric Power cheaper than by the Electric Power Company, but experience proves PURCHASED ELECTRIC POWER to be the most reliable at the lowest cost.

CALL YOUR LOCAL ELECTRIC POWER COMPANY FOR POWER FACTS

Petroleum Electric Power Association

P. O. BOX 2771, DALLAS, TEXAS

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

This department was created for the purpose of aiding managers, superintendents, engineers, chemists, and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Hot or Cold Reflux?

I should like to know whether in a topping or vacuum tower, it has been observed that a great quantity of warmer reflux is preferable to a smaller amount of cold reflux to improve fractionation in the tower?—R.R.M.

To our knowledge nothing has been published about the efficacy, with regard to fractionation, of the use of warm or of cold reflux.

It would seem, however, that the use of cold reflux would be more effective in producing a well-fractionated top product than would warm or hot reflux. In both instances, of course, the amount of each kind of reflux would be such that the same heat load was handled, and in both instances the trays near the top should be designed for their particular liquid-handling job.

Cold reflux would tend to disturb and lower the temperature on the upper trays by failing to attain equilibrium temperature. It would penetrate downward in the tower for several trays before attaining thermal equilibrium and would therefore cause the average temperature in the upper part of the tower to be lower. This would more effectively condense the higher-boiling parts of the feed. One might conclude that lower-boiling hydrocarbons would also be more effectively condensed, and although these could be steam-stripped from the side-draw product, the over-all effect would be the production of a less well-fractionated side-draw product.

In actuality, the products required from most topping towers are so ill-fractionated that the differences suggested above would probably not be significant.

Short-cut for Horsepower

Is there a simple way to compute the horsepower required by a pump—S.B.T.

There is no simple or quick way to accurately determine the power required for pumping but, of course, approximations may readily be made.

About 9 hp. is required to handle 100 g.p.m. if the pressure is raised by 100 psi. This is based on an over-all efficiency of 65 per cent (hydraulic, mechanical, etc.).

As an example, 70 g.p.m. of reflux at atmospheric pressure is to be pumped against a back pressure of 20 psig. The horsepower is 70 per cent of 20 per cent of 9, or 1.26 hp.

Likewise, 1,700 bbl. per day is to be discharged at 400 psig. from a suction pressure of 150 psig. The gallons per minute are:

$$1{,}700 \times \frac{42}{24} \times \frac{1}{160} = \text{about } 50$$

and the differential in pressure is 250 psi. (400 — 150). Accordingly, the horsepower required is about half times 2½ times 9, or 11.25 hp.

Chemical Composition Of Gasolines

In one of your answers you showed the chemical compositions of gasolines on a triangular chart. Can you show the composition of platformate on the same diagram?—S.L.G.

The triangular coordinate diagram published on page 78 of the December 23, 1948, issue of The Oil and Gas Journal has proved to be useful. On Fig. 1 shown here, the compositions of catalytically reformed gasolines using a platinum-type catalyst, lie along the zero per cent olefin line. Thus, such gasolines consist entirely of aromatic hydrocarbons and saturated hydrocarbons (naphthenes and paraffins). Almost all of the paraffins are iso compounds, and this is reflected in the high octane number of platinum reformed gasolines (the aromatics also have high octane numbers).

Also shown are the compositions of a few Fischer-Tropsch synthetic gasolines, taken from Clark et al., Composition of a Synthetic Gasoline, Fischer-Tropsch, Ind. Eng. Chem., 41, 1527 (1949). These consist almost totally of olefinic hydrocarbons and oxygenated compounds. The points shown on the diagram include oxygenated compounds ranging from 2.8 to 14.7 per cent.

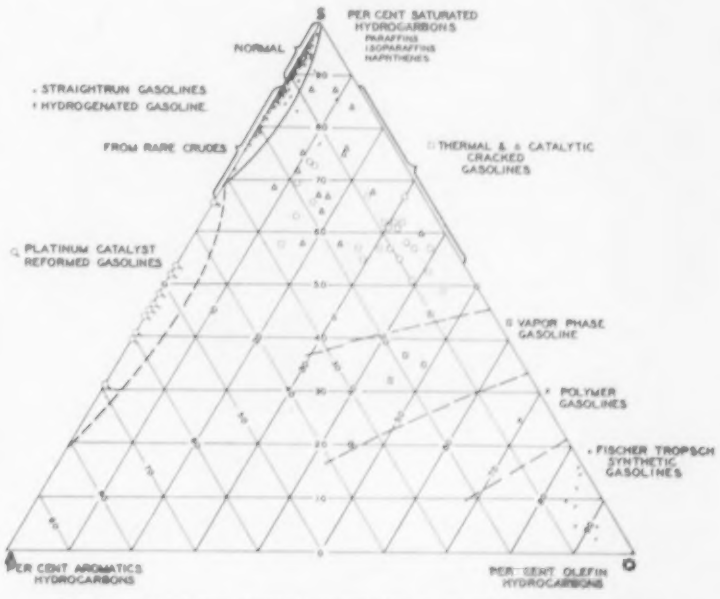
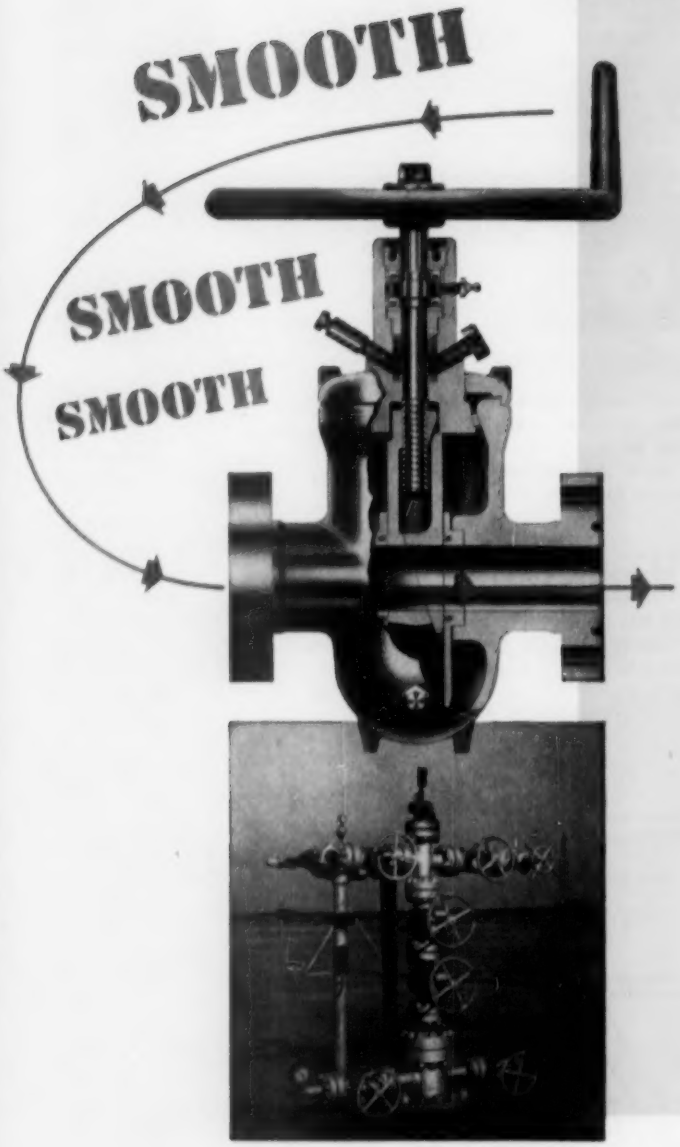


Fig. 1—Approximate chemical composition of gasolines (weight per cent)

Best Choice...

...for NOW and the FUTURE



W-K-M Valves

The fluid flow through a W-K-M-Valve approaches true laminar flow even more closely than the flow through a smooth wall pipe. There is no place for sediment to collect.

The complete story of this quality valve includes also the following features:

- **PARALLEL EXPANDING GATE**
  ... seals on both sides by expansion, not by wedging or jamming.
- **OVERSIZE, RENEWABLE SEATS**
  ... not exposed in either open or closed position.
- **LUBRICATION**
  ... for all moving parts from supply in the body where it prevents internal corrosion.
- **PRESSURE SEAL BONNET**
  ... uses no studs and nuts — self-adjusts to temperature changes — seals tighter as pressure increases.
- **METAL-TO-METAL SEALS THROUGHOUT**
  ... no "O" rings, rubber, fiber or synthetic materials.

W-K-M Valves

W-K-M Manufacturing Company, Inc.

A subsidiary of ACF Industries Incorporated

P. O. Box 2317, Houston 1, Texas Los Angeles, California

Export Office: 45 Rockefeller Plaza, New York, N. Y.

Among the

Drilling Contractors

Pennant Drilling, Ltd., Calgary, Alta., is under contract to Canadian Fina Oil, Ltd., for another exploratory test the operator has planned in the Whitecourt area, of Central West Alberta Province. Associated with Canadian Fina are Hudson's Bay Oil & Gas Co., Ltd., and Stanolind Oil & Gas Co. Location, in LSD 11, 27-59-15w5, is 2 miles southwest of the same operators' new Windfall discovery well, productive from the Devonian D3 zone.

R. L. Manning Co., Denver, is scheduled for a 7,500-ft. Dakota test to be drilled for Mobil Producing Co. at a wildcat location in the East Glenrock area, Converse County, Wyoming. Designation is T-73-24-P Carey-Bixby, with location in 24-33n-75w.

Johnie Carter has been given another contract by Elpasgar Oil Co. for exploratory drilling in the Bushnell area, northwestern Kimball County, in southwestern Nebraska. His new contract is for 1-A U.P.-Panhandle Livestock, in 21-15n-58w, 5 miles northwest of town. His rig has been on Elpasgar's 1 U.P.-Panhandle Livestock, another wildcat in 5-15n-57w, 5 miles north of town.

Green & Dreblow Drilling Co., Bakersfield, Calif., has a rig working for Grover Collins in the Edison area, southeast of Bakersfield, in Kern County, California. It is on a wildcat location at 64X Ross-Kirschenmann, in 8-30-29. Contract is for 5,800 ft.

Clyde Hall Drilling Co., Bakersfield, Calif., has a new wildcat operation going for Signal Oil & Gas Co. in the Waltham Creek area, 10 miles southwest of Coalinga, in Fresno County, California. It is a 4,500-ft. test with the Temblor sand as primary objective. Location is given as 77-24 USL, in 24-21s-13e.

R. L. Manning Co., Denver, is drilling for Shell Oil Co. at 1 Shoshone-Arapahoe, a 3,000-ft. Ordovician wildcat test in the Red Creek area, 12 miles northeast of Burris, in Fremont County, Wyoming. Location is in 11-6n-4w.

Calvert Drilling, Inc., Olney, Ill., has contracted with Gabbs Exploration Co. for a Dakota wildcat test 5 miles south of New Raymer, in southeastern Weld County, northeastern Colorado. Location, at 1 Kitt, in 28-7n-58w, is 3 miles northeast of Jackpot field.

Kerr-McGee Oil Industries, Inc., Oklahoma City, has contracted for a deep test to be drilled for J. D. Wrather, Jr., of Dallas, 1 mile north of production in the Bayou Sorrel area, Iberville Parish, Coastal Louisiana. Location is at 1 Schwing, in 19-10s-11e. Contract is for 11,000 ft. It will drill

On a rig R. Wagner Co. has been operating on a wildcat location drilled for Wagner & Christiansen and Earl Cranston 17 miles southeast of Poplar, in Richland County, Montana. Top row, left to right: Herb Kane, geologist, and Bob Snyder, engineer, representing the operators; Carl Reddies, floorman; Jacob Hansen, derrickman; Gene Guertin, tool pusher; and N. Nickeloff, engineman. Bottom, same order: Red Schwartz, floorman; and Red Thompson, driller. Picture was taken on one of the rare warm winter days in that area.

STOP LEAKS

It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 & 50 lb. cans. Unconditionally guaranteed.

I. H. GRANCELL
1601 EAST NADEAU STREET
LOS ANGELES 1, CALIFORNIA

Many drillers are saving time by permanently attaching Simplex Screw Jacks to the underside of their rig floor. When the rig is to be moved, turnbuckle bracing is unfastened and jack is swung up, out of way. At new location, jack is swung down, turnbuckles attached and jack is ready to level rig. Jack can't get lost, is always available for use.

There's a complete line of Simplex jacks—screw, lever, hydraulic—for all oil field uses.

SEND FOR FREE CATALOG
Simplex
LEVER · SCREW · HYDRAULIC
Jacks
TEMPLETON, KENLY & CO.
2539 GARDNER ROAD, BROADVIEW, ILLINOIS
A. C. Templeton, 5627 Del Roy Drive, Dallas, Tex.

a 14,000-ft. test for its own account at a wildcat location 3 miles northwest of Lake Chicot field, in St. Martin Parish. Its operation is at 1-B Schwing, in 3-11s-9e.

Bearfield Drilling Co. is contractor on a new wildcat operation E. J. Anderson is undertaking in the Westwater Creek area, 4 miles southwest of Harley Dome, in Grand County, Utah. It is an Entrada test at 47-29 Federal, in 29-19s-25e.

C. J. Foster Drilling Co., Richmond, Tex., will drill a 12,500-ft. test for Delhi Taylor Oil Corp. on the east flank of Woodlawn field, in Jefferson Davis Parish, Louisiana Gulf Coast. Location is at 1 Trimble, in 7-9s-5w.

Blackie Drilling Co. is keeping a rig running in the new Lake Enfermer area, Lafourche Parish, Louisiana Gulf Coast, where it is contracting for Olin Gas Transmission Corp. Latest operation is a 14,000-ft. test on the west flank at 4-A Grandison, in 3-20s-23e. The field, opened in March 1955, now has four wells producing gas-condensate from a 13,000-ft. sand.

Hellums Drilling Co. has a new 13,500-ft. contract job scheduled for Union Oil Co. of California in East Lake Palourde field, Assumption Parish, Coastal Louisiana. Location is at 1 Cotton Brothers Unit 1, in 31-15s-14e.

Holmes Drilling Co., Houston, has a new wildcat operation in southeastern Hidalgo County. It is a projected 9,800-ft. test which it is putting down for its own account. Location is 4½ miles east of Weslaco, in Section 131, Block 273, Llano Grande Grant.

Pernie Bailey, Houston, will drill a deep test for Travis Oil Co., also of Houston, in Arthur Harvey field, 7 miles north of Brenham, in Washington County, Texas Gulf Coast. Contract is for 8,600 ft. The test is listed as 2 Quebe, with location in the S. F. Austin 33⅓ Labor.

Glenn Drilling Co., Tulsa, is moving onto the last of three locations it had contracted to drill for Sunray Mid-Continent Oil Co. on 400 acres of leases the latter company had acquired from Murray Petroleum Co. in the Fouke area., in Miller County, southwestern Arkansas. The new operation is at 1 Pierce, in 28-17s-27w, about 1¼ miles southwest of town. It is a 4,900-ft. Paluxy test. The contractor has just completed its second contract, a 5,900-ft. test at 1 Eaves, in 14-17s-27w, 1 mile northeast of Fouke.

What is your Control Need?

. . . a starter for a fractional hp motor?

This small inexpensive control provides thermal overload protection. . . . Compact construction permits mounting where space is at a premium. Designed for use on ac single-phase power systems . . . up to 230 volts.

. . . a controller for a 2300 to 5000-volt motor?

Here is a control for motors up to 2500 horsepower. All components — contactors, meters, overload relays, auxiliary switches — are selected to meet the particular requirements of your application. Current-limiting fuses give split cycle short circuit protection.

. . . or other applications?

Specific applications, including those between the above-mentioned limits, are made from an extensive line of starters and control components. These standard units are factory assembled in infinite combinations to meet practically any requirement. For help on a particular application, call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by experience gained solving thousands of control problems . . . by complete research and testing facilities.

A-4721

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

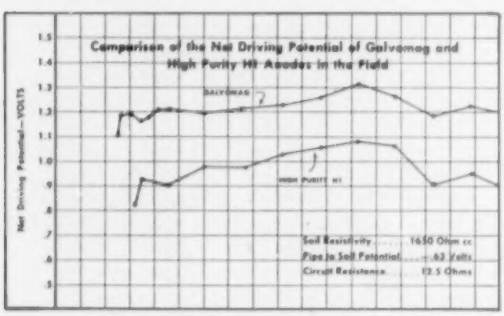
Field tests, made in various soils, have substantiated laboratory tests showing GALVOMAG does produce 20-30% more current than conventional anodes.

ANODES TESTED

Results: Galvomag Best

Dow's new high-potential anodes furnish 25% more current output than conventional anodes . . . save you money by requiring fewer installations!

Because of their higher driving potential, four GALVOMAG* anodes do the work of five conventional anodes in average soils—a distinct savings for you in installation costs.


Comparison of the Net Driving Potential of Galvomag and High Purity Mg Anodes in the Field
Net Driving Potential—VOLTS
GALVOMAG
HIGH PURITY Mg
Soil Resistivity ..... 1650 Ohm cc
Pipe to Soil Potential ..... .62 Volts
Circuit Resistance ..... 12.5 Ohms

Actual field test data showing GALVOMAG's superior driving potential.

Also, because of greater throwing power, GALVOMAG anodes offer you better protection in higher resistivity soils. Call your Dow anode distributor. He'll give you the facts on how GALVOMAG can reduce your cathodic protection costs.

Greater protection and substantial savings, too—a valuable combination. Take advantage of it! THE DOW CHEMICAL COMPANY, Dept. MA 376Q, Midland, Michigan.

*Trademark of The Dow Chemical Company

Call the distributor nearest you:

CATHODIC PROTECTION SERVICE, Houston, Texas • CORROSION SERVICES, INC., Tulsa, Oklahoma • ELECTRO-RUSTPROOFING CORP. (Service Division), Belleville, N. J. • ROYSTON LABORATORIES, INC., Blawnox, Penna. • STUART STEEL PROTECTION CORP., Kenilworth, New Jersey • THE VANODE CO., Pasadena, California

you can depend on DOW MAGNESIUM ANODES DOW

GOOD coating jobs can become excel'ent ones with adequate inspection.

How to Do a Better Job of Inspecting Coatings

A coating inspector on a pipeline job inherits a big responsibility. The quality of the coating job depends largely on his knowledge, experience, and actions. This is no reflection on the pipeline contractor, but many things needed for a good coating job just won't be done without competent inspection.

by Pearce R. Butterfield

A PIPELINE company's corrosion engineer is primarily interested in getting a good-quality coating on a new line. For this he must rely on the actions, knowledge, and experience of his coating inspectors. In this respect, there is no doubt that money is wasted when companies buy high-quality coating material then fail to use enough competent inspectors. In contrast, what may be considered an inferior material may give many years of good service if applied under ideal conditions and with good inspection.

Author is with Transcontinental Gas Pipe Line Corp. From a paper presented at the 1955 south-central regional meeting of the National Association of Corrosion Engineers.

Coating inspectors can be classified as follows:

1. Negligent, uninterested, absent from job. Under this type the poorest results are obtained. Expect bare sections of pipe, casing seals and spacers left off, test leads not attached to the pipe, welding-rod cans and skids in the ditch, etc.

2. Interested but lacks experience. Results with this type inspector are hard to predict and much will depend on the contractor's integrity.

3. Interested, qualified, and experienced. This inspector will produce a good job with mediocre material and a superior job with good material.

Inspection Tips

A coating material is certainly no better than the way it is put on. The following are major divisions of a coating inspector's job with pointers to help in the solution of the most important problems.

Cleaning and priming . . . Before priming the pipe should be free of rust, mill scale, grease, dirt, etc. Pipe fresh from the mill should be inspected closely for mill scale. Remember, this scale is cathodic to steel and if placed in a conductive medium will set up a galvanic cell. Either shot or sand blasting is the best way to remove mill scale; brushing tends to polish the scale rather than knock it off.

If the pipe has weathered so that the mill scale is gone, the inspector will be faced with the problem of removing rust. In no case should flakes of rust be left on the pipe. They should be removed by chipping, sand blasting, or slower operation of the cleaning machine. Watch closely for heavy rust on pipe that has been on the right-of-way for some time.

Finely divided iron oxide isn't objectionable if the primer can wet through to the steel surface. This means that the primer must be put on heavy enough to wet through. But if it drips or runs, it should be brushed smooth by hand.

Coating . . . Enamel should be put on over a properly cured, yet not a dead primer. Test for dead primer by scraping it with a knife blade. It should roll up in a soft ball, not flake off in hard chips.

Don't coat over heavy layers of dust which may collect on the pipe during construction in dry weather.

Don't coat over wet primer or pipe with moisture on it. When enamel hits moisture, steam is formed which results in blisters and holidays in the coating.

If glass-fiber wrap is used, keep it dry until applied. Then see that it is pulled well into the hot enamel. Felt outer wrap also must be dry; damp felt can cause blisters in the coating.

Holidays . . . Find the cause of holidays wherever possible; most can be prevented by proper handling and application of the coating material. Patching of holidays should be watched closely. Prime any exposed metal. See that the primer is clean and hasn't been carried too long in open buckets so that its solvents have evaporated. Be sure the enamel used in patching is at the right temperature or else it won't bond properly. Remember, a poor

PIPELINE PATROL

patch job on a small holiday is usually worse than no patch job at all.

Coating inspection doesn't end with finding and patching of holidays. Keep an eye on the coating until the line is backfilled. You may prevent a lot of damage caused accidentally or by thoughtless acts by workmen.

Valves and casings . . . Big valves are hard to coat at best and may be one large holiday unless given close attention during coating.

Proper casing insulation is probably the second most important item to a corrosion engineer. One 80-ft. section of shorted 42-in. casing equals the bare area normally found in 17.5 miles of well-coated 36-in. pipe. So see that casing insulators are put on at the correct interval and properly tightened so they won't slide. If they are too far apart, the pipe will sag and short to the casing—a type of short almost impossible to clear once the line is operating.

Also, see that there is enough slack in the approaches to a casing so that stresses in the carrier pipe won't rupture the casing or crush the insulators. It is vitally important to check the resistance between casing and pipe after the pull is completed. At this stage a short can be corrected relatively easy. But once the line is in operation, clearing a casing short is costly and complex.

Test leads . . . Learn and understand why test leads are put on a line. They are very important to the corrosion engineer in determining the effectiveness of cathodic protection. They are easy and cheap to put on during construction but costly to install later, so get them on right the first time. Be sure IR-drop leads are properly spaced on the pipe and oriented according to whichever direction of line flow is specified on the drawings. Otherwise they may be useless and at best will give dubious results when used.

Insulating flanges . . . Take particular care to see that bolt insulating sleeves and gaskets or rings between companion flanges are not shorted when installed. Assemble the flange and check resistance across it before welding into the line. A shorted bolt may be repaired without too much trouble, but after the line goes into operation a shorted gasket can only be repaired by shutting down the line. It involves as much trouble as a shorted casing.

The results of your work as a coating inspector and the care and judgment you have used will be evident when the line is completed and current requirement tests are made.

Announcing the improved
TYPE "Z"
WmSEAL CASING
BUSHING
STAINLESS STEEL CLAMPS ARE HAND TIGHTENED, NO TOOLS REQUIRED
SOLID RING OF TOUGH SYNTHETIC RUBBER — NO JOINT
TIGHTER SEAL WITH WIDE STAINLESS STEEL BANDS AND CLAMPS
"Z" BUSHINGS STAY PUT EVEN IF PIPE MOVES IN CASING
COMPLETE CORROSION RESISTANCE
NO SHIELD REQUIRED
WmSEAL "Z" BUSHINGS ARE AVAILABLE FOR 4" SIZE AND LARGER PIPE
NON-SKID TEETH ON EXTRA LONG SKIRT HOLD BUSHING FAST TO CASING
EXTRA THICK "SHOULDER" (TOUGH SYNTHETIC RUBBER) CANNOT CUT THROUGH EDGE OF CASING

T.D.Williamson, Inc.

P. O. BOX 4038 TULSA 9, OKLAHOMA

REPRESENTATIVES: Houston • Pittsburgh • Plainfield, N. J. • Amarillo • Casper • Provo, Utah • Joliet, Illinois • Los Angeles • San Francisco • Bartlesville, Okla. • Edmonton • London, Ontario • Calgary • Buenos Aires • Durban, Natal, South Africa

Old Bricks Are Put to Use To Make a Heater House

KANSAS-NEBRASKA NATURAL GAS CO. uses old bricks effectively to make a building for heater and regulators. It is built by the roustabouts and has no doors. Instead, a door is made in the roof with steps down to the ground.

The heater is made so that only the burners are on the outside. The gas passes through a hot water bath inside the building.

With the strong, cold winds of western Kansas blowing, it takes a minimum of heat and fuel to keep the regulators from freezing up.

PIPELINE PATROL

The brick heater and regulator house is shown on the left and the meter house on the right.

Treated Stepover Posts Aid R. O. W. Maintenance

USE of a pentachlorophenol treatment on "step-over" posts is an important part of right-of-way maintenance by Natural Gas Pipeline Co. of America.

The company has parallel 24 and 26-in. lines between the Texas Panhandle and Chicago. Pipeline crews, whose main job is preventing or repairing erosion damage and checking for and repairing leaks caused by corrosion, must have ready access to all parts of the right-of-way.

The rights-of-way must be free from erosive conditions which, if not corrected, can cause a pipeline washout. Stream banks must be maintained and controlled. Field measurements must be made periodically to check effectiveness of corrosion prevention methods. All this requires inspection or work by men on foot.

A maintenance job or an inspection may require walking several miles of the right-of-way and involve crossing dozens of fences. To make the job easier and to prevent damaging fences, "step-over" posts are used wherever gates are undesirable or impossible to install. These posts have conventional pole steps attached so a person can easily step over the fence.

Keeping the posts in good shape is where pentachlorophenol, or "penta," comes in. It's an excellent wood preservative. So the posts are all treated with this compound which prevents wood-rot and repels attack by bacteria, insects, and fungi.

The aboveground portion of the posts are painted a bright orange as a marker for the air-patrol pilot who flies the line regularly.

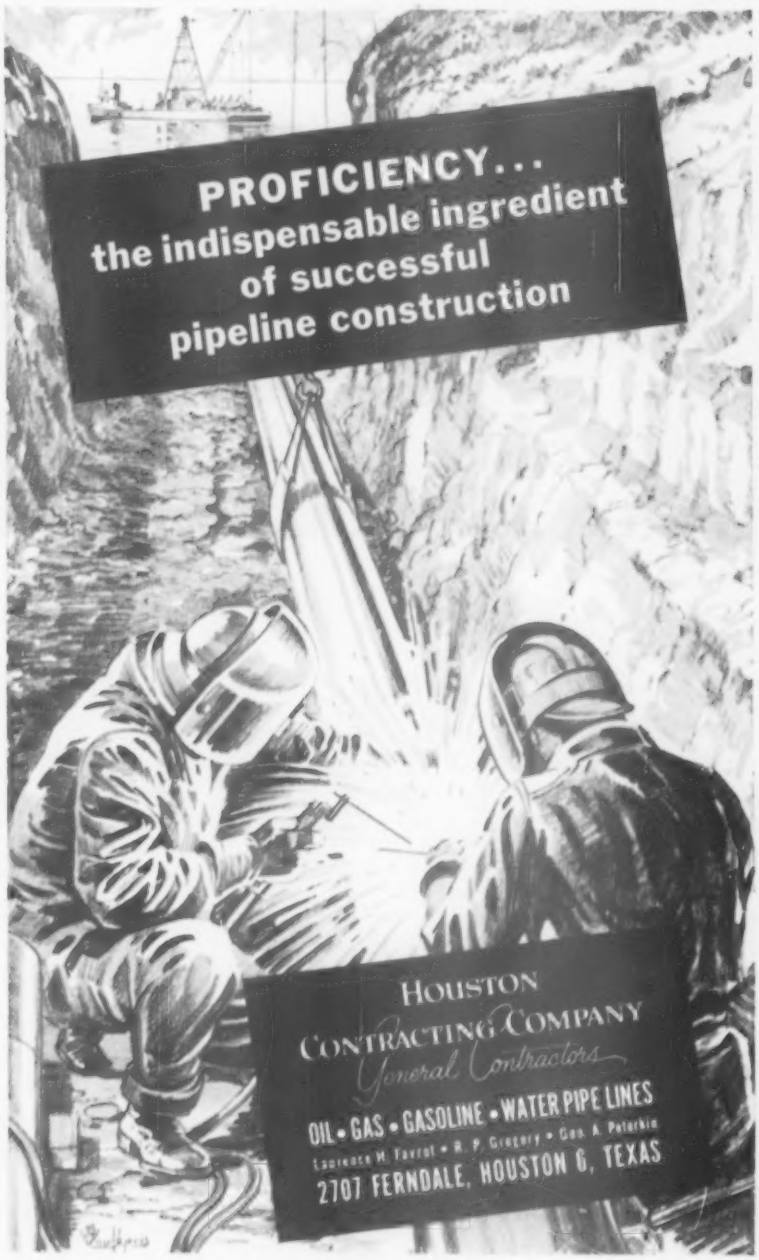
Thus, the penta-treated posts are definitely a part of the big job of maintaining a good pipeline right-of-way. Good posts in a farmer's fence across a pipeline mean good public relations—essential to the progress of any company.

BOOK

REVIEWS OF PETROLEUM TECHNOLOGY, Vol. 14. Published by the Institute of Petroleum, 26 Portland Place, London W.1, England. 217 pp., $4.90.

This fourteenth volume of the Institute's Reviews covers the period from 1952-1954. It is divided into nine chapters which discuss: (1) geology and regional developments; (2) drilling and production; (3) refining processes and plant; (4) chemistry and physics of petroleum; (5) crude petroleum and its products; (6) testing and evaluation of petroleum products; (7) synthetic liquid fuels from coal and shale; (8) transport, storage, and distribution; and (9) petroleum industry trends.

Each chapter was compiled by a British authority on the subject discussed, and the writing style has been simplified for easier reading.



Economical DOWELL fracturing treatment employs lease crude base

PETROFRAC

Here's double economy in fracturing . . . less expensive fracturing fluids, plus performance features that can bring better results per-treatment-dollar in many pays.

Petrofrac® uses the operator's own lease crude. The crude is emulsified to give it excellent sand-carrying ability. Thus high sand concentrations are possible with little danger of screen-outs, even in large shot holes.

Where desired, Dowell's skilled engineers can tailor Petrofrac fluid from kerosene, diesel fuel or distillate. These high-gravity fluids permit even easier return of treating materials and fast well clean-up. In gas wells, they avoid contamination of the formation.

Both oil and gas well operators have gained outstanding production increases in sandstones, limestones and dolomites with this exclusive Dowell treatment. And Petrofrac is fast, requires no gel-breaker, no shut-in time.

For Petrofrac service, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department A-11.

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

The OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

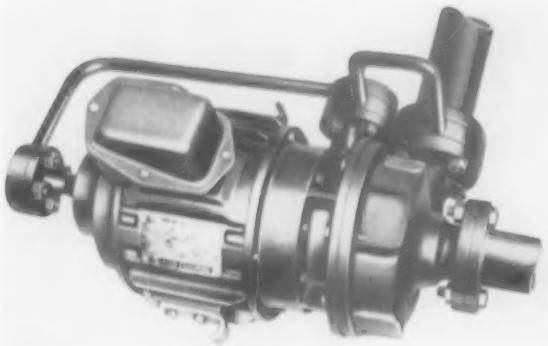
Portable Inspection Kit Requires No Electricity

A new magnetic particle inspection device requires no electrical power. This portable Magnaflux YM-5 yoke kit reliably finds cracks in magnetic parts or members.

Since electric arcing is impossible, the YM-5 makes practical the inspection of critical parts or welds in hazardous areas. Refineries and chemical plants will no longer be forced to delay or stop operations before performing certain preventive-maintenance inspections. Necessary inspections need not be omitted. It eliminates the need for disassembly, heavy equipment, and electric power, and greatly increases the efficiency of these regular inspections.

The kit comes complete with a metal storage and carrying case. Total weight is only 22 lb. The yoke legs are hinged and the angle-cut tips rotate so that good magnetic contact can be made on almost any shape part. The permanent magnet elements are Alnico, and Magnaflux has developed a new magnetic circuit which gives the YM-5 an especially effective magnetizing power for its weight. The magnetic pull is over 40 lb. on a flat surface, while the yoke itself weighs just 5 lb.

A spray gun, two powder bulbs, and wet-bath and dry-powder magnetic particle materials are included. **For more information write or call: Magnaflux Corp., 7300 West Lawrence Avenue, Chicago 31, Ill.**



Electri-Cand Pumps Are Leakproof

Two new lines of leakless general-purpose centrifugal pumps, the Electri-Cand, are designed for handling precious or hazardous liquids where no leakage is permitted. The pumps are available in a fractional horsepower line, C-11A and C-11B, covering motors above 2 hp. They are capable of accommodating heads to 250 ft. and temperatures to 250° F. and can be had with capacities to 500 g.p.m.

The Electri-Cand pump utilizes the canned motor principle in which the rotor of the driving induction motor rotates in the fluid being pumped and is connected directly to the pump impeller. This construction requires no packing or mechanical seals. All rotating elements of pump and motor are contained in a thin wall cylinder making an absolutely leakproof unit.

The Type C-11A integral horsepower

The OIL AND GAS JOURNAL Showcase Coupon

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

MANUFACTURER _____

ADDRESS _____

CITY _____ STATE _____

Please send me complete information on the following item

_____

_____

Described in the Jan. 16, 1956 issue of The Oil and Gas Journal

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

DATE _____

pumps have long-lived fluid piston radial bearings throughout. These are supplied with liquid through an internal connection with the pump-casing discharge nozzle.

Construction of the Type C-11B pump is similar to that of the C-11A except that the external piping is eliminated and less costly carbon sleeve radial bearings are used. There is some circulation of the liquid to wet the bearings and to flush out any solids that might get into them. **For more information write or call: Allis-Chalmers Manufacturing Co., Industries Group, Milwaukee 1, Wis.**

You can take it for granted...

Your letters will be collected and delivered anywhere in the world. The Kenyon service is also world-wide and you can be sure the latest developments and materials for the thermal insulation of steam raising and chemical plants are always available. Specifications, application and supervision on sites anywhere. Our engineers are at hand for consultation at all times.

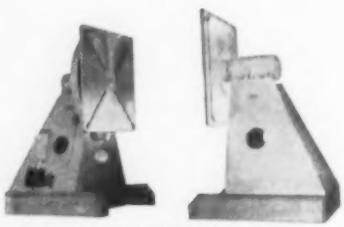
KENYON
PLANNED HEAT INSULATION

WM. KENYON & SONS (AMERICA) LTD., PERTH AMBOY, N.J., U.S.A.
WILLIAM KENYON & SONS LTD., DUKINFIELD, CHESHIRE, ENGLAND
KH 188

11-Pound Midget Chain Hoist Lifts 250 Pounds

An 11-lb. midget chain hoist capable of lifting 250 lb. has a standard lift of 7 ft. and a minimum distance of 9 in. between hooks. Extra chain is available for greater lifts. One man can easily lift a load 30 ft. in one minute with the midget hoist.

Each hoist is factory tested 100 per cent over rated capacity. The load is held safely by an automatic load brake at all times, greatly reducing the possibility of accidents from falling loads. Ball-bearing trolleys rated at 250 lb. and made to fit all standard 3 to 10 in. I-beams also are available. **For more information write or call: Coffing Hoist Division, Duff-Norton Co., 800 Walters Street, Danville, Ill.**



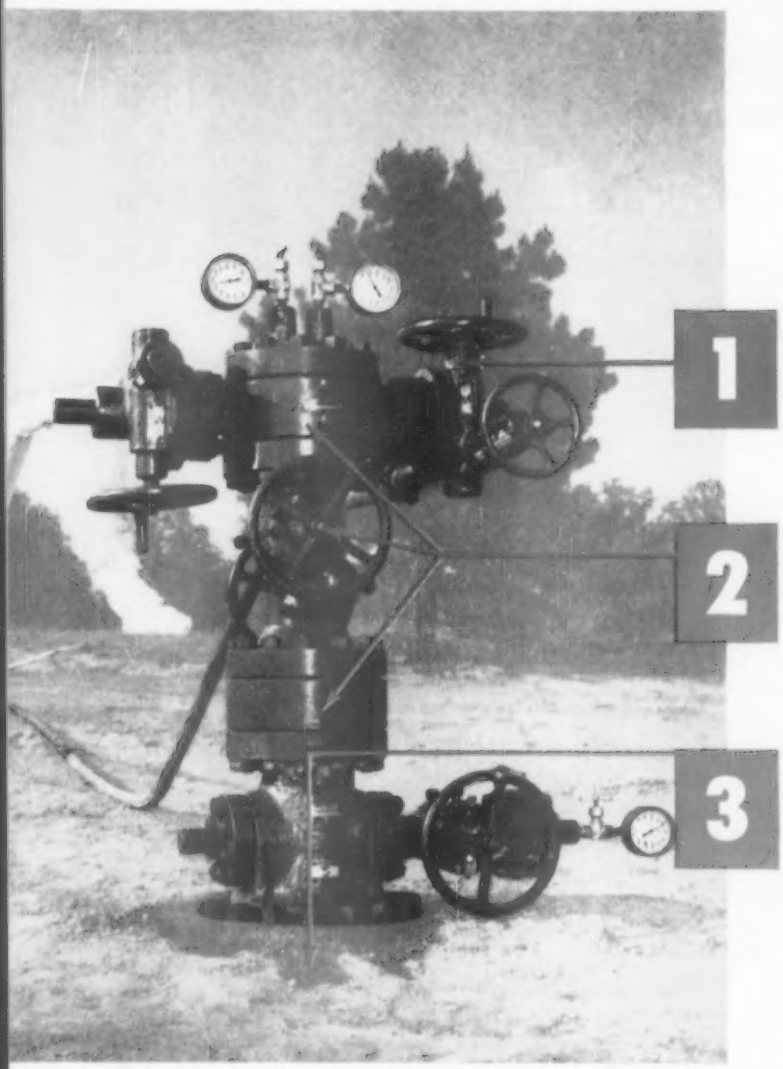
HEAD & TAIL STOCK POSITIONERS

New Stock Positioners Are Built in Pairs

A new line of head and tail-stock positioners is normally built in pairs, one consisting of a constant-speed motor-driven head stock while the other consists of an idling-type tail stock.

Among the more common uses for this type of equipment is the positioning of large bulky objects, such as trailer frames, tank hulls, or large bulky weldments where it is desired to rotate the object around a fixed axis for automatic welding, inspection, or painting.

The positioners are now available in sizes ranging from 5,000 to 32,000-lb. capacity. Power to the motor-driven head stock is through integral type motor-reducer direct to pinion and final drive gear. The primary gear reduction operates in fully enclosed oil bath. The motor is equipped as standard with built-in magnetic brake. **For more information write or call: Reed Equipment Division, Webb Corp., Webb City, Mo.**



Here are three outstanding cases where quality and economy do mix. O-C-T — a recognized industry leader in wellhead quality and service — also offers these three products to help operators reduce well costs.

O-C-T TYPE "JE" FLOW CONTROLS

With the "JE," one unit takes the place of the four that go to make up a conventional flow wing. First cost is reduced by as much as 90%. Weight is cut up to 70%. Valve repair costs are cut to a minimum. The "JE" Flow Control is a money-saver for use on nearly all Christmas Trees, regardless of size or type. Be sure to order a "JE" as a part of your next Christmas Tree.

O-C-T DUAL COMPLETION CHRISTMAS TREES

With this assembly, one well can do the work of two. Two zones can be produced with equal efficiency. Each can be serviced independently. O-C-T assemblies are true O-C-T all the way through in quality, safety, and economy. Be sure to specify O-C-T on your next dual completion.

O-C-T TUBING AND CASING HEADS

The O-C-T Type T-20 Tubing Head features the quality of the T-16 without costly lockdown screws which are not needed with the O-C-T Dual Completion Trees. The O-C-T Type C-20 Casing Head saves rig time and simplifies the setting of casing under full blowout preventer control. On medium depth wells, it gives all the advantages of the C-19 at a lower first cost. Ask your O-C-T Representative for full information.

THREE GOOD WAYS TO KEEP WELL COSTS DOWN

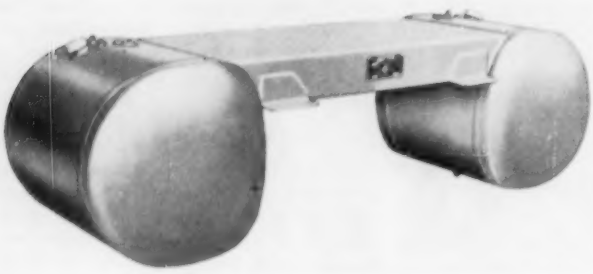
O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A. Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

OIL AND GAS JOURNAL **Showcase** ..... OF NEW EQUIPMENT



Saddle Tanks Made for Oil Field Trucks

Semioval saddle tanks are designed to give increased fuel capacity to oilfield trucks without increasing the amount of space required. They do not require special brackets for installation but can be bolted directly to the truck frame.

Semioval saddle tanks feature offset weld for greater safety and crash resistance. The tanks have an overlapping head which places the weld a full inch from the point where the head of the tank starts to curve, making it impossible to hit a forceful blow directly in line with the vulnerable weld. Under any sudden pressure, the metal of the tank will fold instead of shearing.

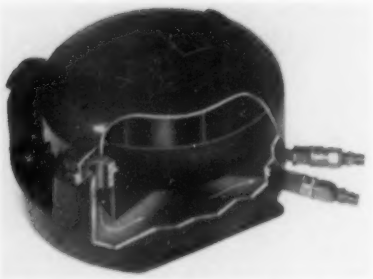
Safer semioval saddle tanks are manufactured in 110 and 135 gal. capacities and are spaced 37½ in. apart. **For more information write or call: Master Tank & Welding Co., 1612 Singleton Boulevard, Dallas, Tex.**

●

Field Centrifuge Made to Preheat Crude Samples

A new field centrifuge has been designed to preheat crude oil samples and keep them warm during the spinning period. This new centrifuge contains a water tank which utilizes hot water from the gager's vehicle motor. Efficient circulation throughout the centrifuge is achieved by a series of baffles in the centrifuge tank.

The new unit offers two major advantages: (1) more consistently accurate b.s. and w. test results, and (2) economy. Because it offers facilities to

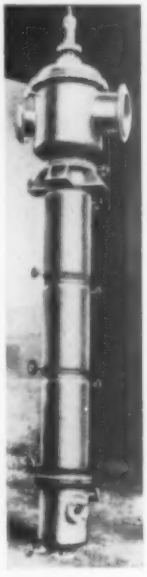


preheat samples and keep them warm, this centrifuge makes it possible for the gager to run tests under more consistent conditions, regardless of weather. This assures more consistently accurate test results. Electricity is required only during the spinning period. Therefore, battery drag and the expense of idling the vehicle motor during the test is practically eliminated.

The heated centrifuge has a built-in switch-rheostat with safety pilot light. Speeds are variable up to 2,400 r.p.m. Similar models are available for either 6 or 12-volt electrical systems. **For more information write or call: W. L. Walker Co., 1009 South Main Street, Tulsa, Okla.**

●

Floating Blade Improves Evaporator Efficiency



A new continuous turbulent floating-blade evaporator, permits the thinnest possible films on the heat-transfer cylinder and smaller amounts of material in process. Called the Turba-Film floating-blade evaporator, the new unit is ideal for reduction of solutions from which the intermediate product is to be a mixture of crystals and liquor. In some instances, it is possible to produce dry powder. The floating-blade evaporator is similar in principle to the Turba-Film evaporator, differing in one significant respect. The blades of the rotor are pivoted so that they ride on a thin film of liquid flowing down the heat transfer cylinder.

Because of the wiping action of the rotary floating-blade system, the action of the heating medium on the thinly distributed product is reduced to a matter of seconds for each particle of the material in process.

Blades are constructed of metal,

OIL AND GAS JOURNAL **Showcase Coupon**

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

MANUFACTURER _____

ADDRESS _____

CITY _____ **STATE** _____

Please send me complete information on the following item

_____

_____

Described in the Jan. 16, 1956 issue of The Oil and Gas Journal

NAME _____ **TITLE** _____

COMPANY _____

ADDRESS _____

CITY _____ **STATE** _____

DATE _____

nylon, Teflon, or other material appropriate to the substance in process. The evaporator is adapted especially for the separation by distillation of heat-sensitive materials which, under conventional distillation or condensation, tend to decompose or polymerize, or lose essential qualities.

The process of distilling or evaporating fluids in the evaporator is effected with the help of an integral metering pump and foam separator. The apparatus distills any kind of fluid including those which foam badly. Foaming, which often represents waste of end product in the processing of liquids under vacuum, is controlled in such a way as to entail no loss. Continuous movement of the fluid, impelled by the rotating blades, prevents the formation of crust or coke on the walls of the heating chamber. **For more information write or call: Rodney Hunt Machine Co., Orange, Mass.**

•

Ha-Da Lowers Cost of Tank Maintenance

Ha-Da, a new glass fiber-thermosetting resin liner, is proving itself in saving oil-field tanks and adding years to their use. Field testing of Ha-Da processed tanks has revealed that, after 8 months usage, tanks show no corrosive action and look as if the plastic flooring had been just installed.

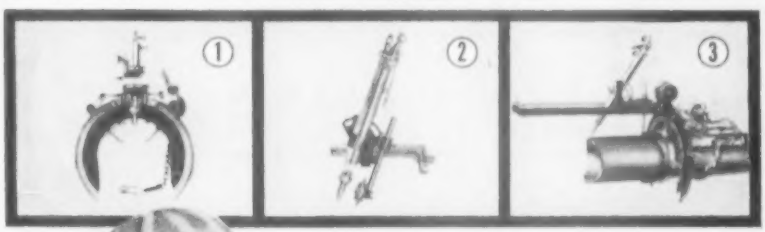
The liner material is light weight, heat resistant to 200° F., and impervious to corrosion and acids which quickly deteriorate standard-steel oil-field tanks.

Leaking tanks are first sand blasted. Any large bottom holes are plugged with patches of glass fiber. Rolls of glass fiber are then spread over the bottom and laid 9 in. up the tank sides. Activated resin is troweled on and allowed to set at room temperature. After the first coat sets, a second coat is laid on to cover any pin holes in the first coat. The finished layer is about ⅛ in. thick.

Cost of replacing the tank bottom with glass fiber, is about one-half the cost of having a new steel bottom laid into a tank. Where concrete has been used to patch bottom holes, the field tanks have become immovable. With plastic the tank can easily be transported.

The plastic bottom has proven not to be soluble in gasoline, naphtha, crude, or sour crude oils. Installations in salt water pits, or in salt water closed systems, have shown no damage to the plastic during a period of more than 8 months. **For more information write or call: Plastic Engineering Co. of Tulsa, 3128 East Admiral Place, Tulsa, Okla.**

OIL AND GAS JOURNAL Showcase .....OF NEW EQUIPMENT



For complete pipe cutting and beveling equipment . . . H & M

① **THE H & M MACHINE:** The lightest, semi-automatic pipe beveling machine ever made. Now you can cut and bevel 36" diameter pipe quickly, accurately with the #5 H & M **weighing only 95 lbs.** Proportionate weight reductions in the other H & M cutters and bevelers.

② **OUT-OF-ROUND:** For simple, fool-proof cutting and beveling of out-of-round pipe get the H & M out-of-round attachment, manufactured to fit all H & M Pipe Cutting and Beveling Machines. The roller guide follows the pipe contour . . . the torch follows the roller guide.

③ **SHAPE CUTTING:** You can reduce the time consumed in shape cutting **up to 95%** with H & M semi-automatic shape-cutting equipment. One master template furnished with each shape-cutter. Write for your free copy of "More Profit Dollars for All Types of Pipe Fabrication Work."

Why H & M is the FIRST name in pipe-beveling.

Many have imitated H & M design, but none have found a substitute for H & M quality. Accuracy . . . durability — these are features that are part of the H & M brand. H & M — first in its field . . . and now 40% lighter.

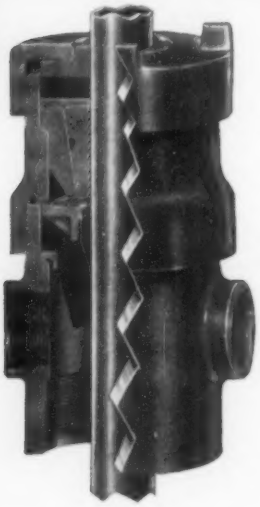
H&M PIPE BEVELING MACHINE COMPANY

U. S. Trademark Reg.

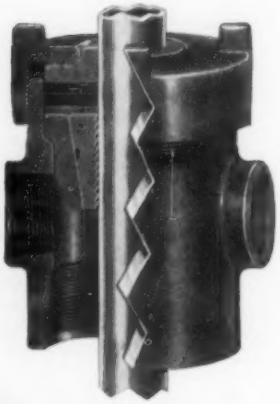
311 East Third Street
Tulsa, Oklahoma, Ph. DI 3-0241

LARKIN HEADS for medium pressure wells

LARKIN
TYPE "L"
TUBING HEAD



LARKIN
TYPE "SR"
TUBING HEAD



LARKIN
TYPE "R"
TUBING HEAD

The Larkin Type "L" Tubing Head . . . a comparatively new member of the Larkin Well Head Line . . . fills a need in low pressure areas where economy may be effected with complete safety.

Larkin Type "L" Tubing Head Features:

1. Forged steel construction
2. 2000 p.s.i. test
3. Full opening
4. 2" or 3" side outlets
5. Top of body threaded 7" API to accommodate control equipment
6. Hinged three-segment slips
7. Hammer-up lugs and bar holes for ease in make-up
8. Parts for 5½" and 7" sizes are interchangeable.

Also illustrated are the well-known, dependable Larkin Type "SR" and Type "R" 4000 p.s.i. test Tubing Heads which are so widely used in medium pressure fields.

For detailed information on these and other Larkin Tubing and Casing Heads, please refer to your Larkin Catalog or discuss them with your nearby Larkin Representative. All Larkin equipment is available through your supply store.

We've moved — Our new address is:

LARKIN PACKER COMPANY, INC.

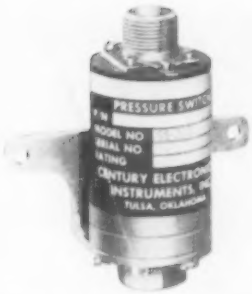
WAXAHACHIE, TEXAS

W A X — A — H A C H I E

(rhymes with walks) (rhymes with scratchy)

LARKIN

...Through Your Supply Store



New Pressure Switches Resist Corrosion

A line of pressure switches supplements Century's instrumentation products. Resistance to temperature, vibration and corrosion effects, compactness and light weight are notable features in these vacuum, low pressure, differential pressure, and altitude switches. No pressure problem, either high or low, has been neglected. Where required, switches conforming to military specifications and other special applications can be supplied. **For more information write or call: Century Electronics & Instruments, Inc., 1333 North Utica, Tulsa, Okla.**

•

New Instrument Titrates, Plots Curves Automatically

Redesigned for closer accuracy and more convenience in both aqueous and nonaqueous titrations, the Precision-Dow dual recordomatic titrometer actually titrates, automatically controlling the rate of reagent feeding and automatically plotting titration curves.

An electronic-feed-control relay regulates reagent feeding, while an electronic recording potentiometer records both the volume of titrant added and the emf applied. Manual plotting and manual incremental addition of the titrant are eliminated, and titrations are performed in a fraction of the time required for manual titrating, a complete titration in 5 minutes or less. Human error also is eliminated, providing greater accuracy in end-point determinations; an accuracy of 0.05 ml. (one drop) of titrant, even with two, three, or more end points.

The detecting circuit utilizes grid currents on the order of 10^{-13} amp. Even difficult nonaqueous titrations are rapid, easy, and certain. Highly colored or opaque solutions do not interfere with the end-point readings. All titration curves are easily and precisely reproduced.

Applications of the dual recordomatic titrometer include analyses of inorganic chemicals, petroleum products, rubbers, waxes, and solvents. **For more information write or call: Precision Scientific Co., 3737 West Cortland Street, Chicago 47, Ill.**

WHAT'S YOUR CORROSION CONTROL I.Q.

Do you know that 2 ounces of Mutual Chromate protects an automobile cooling system (4 to 6 gallon capacity) against corrosion for an entire summer season?

Do you know that corrosion in the cooling system of a diesel locomotive is effectively controlled by 2,000—2,500 ppm of Mutual Sodium Chromate? This amount is equivalent to 10 pounds for a large road engine.

Do you know that 500-5,000 ppm of Mutual Sodium Chromate in the cooling system of a marine diesel provides protection against corrosion?

There are many other examples of corrosion being successfully controlled by Mutual Chromium Chemicals. Write us if you have a similar problem.

Sodium Chromate • Chromic Acid • Sodium Bichromate
Potassium Bichromate • Potassium Chromate

MUTUAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
99 PARK AVENUE • NEW YORK 16, N. Y.

NATIONAL AIROIL

Oil Burners

OF THE STEAM AND MECHANICAL TYPES NOW COMBINED INTO

Dual Stage BURNERS

Now, at last, the inherent advantages of *both* systems of fuel oil atomization are *profitably* yours . . . within the one, new NATIONAL AIROIL Dual Stage Burner.

43 years of combustion equipment design and manufacture are in back of the Dual Stage Oil Burner . . . and, it has been thoroughly tested and proved on the field for firing: Petroleum Processing Heaters; Rotary Kilns; H.R.T., Scotch Marine and Water Tube Boilers; etc.

Available in three sizes, the NATIONAL AIROIL Dual Stage Burner fires all grades of fuel oil from No. 2 to No. 6, with a ready capacity of 80 to 300 g.p.h. Further, for a perfect flame pattern, we would recommend using with the Dual Stage Burner either the NATIONAL AIROIL Universal Register for forced draft, or the NATIONAL AIROIL Tandem Unit for natural or induced draft furnaces.

Get detailed description, illustration, and specifications in NATIONAL AIROIL Bulletin 25.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
SLUDGE BURNERS, Steam Atomizing
MOTOR-DRIVEN ROTARY OIL BURNER
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
DUAL STAGE, combining Steam and Mechanical Atomization
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING AND HEATING UNITS
FURNACE RELIEF DOORS
AIR INTAKE DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

Established 1912 *Incorporated 1917*

NATIONAL AIROIL BURNER COMPANY, INC.

1236 E. Sedgley Ave., Philadelphia 34, Pa.
S. W. Division: 2512 So. Blvd., Houston 6, Texas

The OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Two-Stage Steam Jet Vacuum Pumps. New Bulletin 5H2 describes the two-stage steam-jet vacuum pumps. These pumps are usually used where single-stage units will not provide economically a suction pressure as low as desired. For lower absolute pressures, units with additional stages are recommended. Types of units described include: condensing vacuum pumps with barometric intercondenser; a special low-level arrangement of a direct-contact condenser; condensing vacuum pumps with surface condensers (with types of surface condensers); and non-condensing vacuum pumps. **For more information write or call: Schutte & Koerting Co., Cornwells Heights, Bucks County, Pa.**

●

Steel, Aluminum and Stainless Grating and Stair Treads. An illustrated report on the usage of steel, aluminum, and stainless grating and stair treads discusses the various types of electroforged welded grating as well as offering dimensional sketches and data on riveted grating. A detailed safe load table with conversion factors, panel-width-constant chart and data on the standard widths and types of steel stair treads most frequently used are also recorded. **For more information write or call: Klemp Metal Grating Corp., 6601 South Melvina Avenue, Chicago 38, Ill.**

●

Industrial Homes, a new catalog, has tabbed pages to sectionalize information on industrial housing into the following classifications: general information, references, models, wall sections, construction details, the lease-rental plan, merchandising, products used, and prices. The general-information section includes illustrations of individual homes and complete multiple-home housing projects. The models section shows the floor plan and a brush picture of the outside appearance. The lease-rental section explains how these homes can be built and leased to companies without making the capital investment of ownership. The section on products used shows in color a selection of floor coverings,

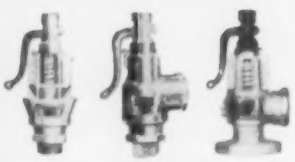
TRADE MARK REG. U. S. PAT. OFF.
TIME TESTED
MACCO
GAS LIFT

Telephones:

ALICE
4-4993 4-5787
MIDLAND
3-3936 2-5323
VICTORIA
Hillcrest 5-1731 WJ-53395
BEAUMONT
5-1958 ZF-78424
HOUMA, LA.
2-2147 7728 2-1285
NEW IBERIA, LA.
4-2674
HOBBS, N. M.
3-5059
*LONG BEACH, CALIF.
NE 6-4666
*LOS ANGELES, CALIF.
JE-5261
*VENTURA, CALIF.
MI 3-4033
*TAFT, CALIF.
5-3244
*Calif. Rep. Emsco Mfg. Co.

MACCO
OIL TOOL CO.
1521 PRINCE ST., HOUSTON 8, TEX.
UN 1-1253
HO 5-7585 MI 9-0747 UN 4-0777
MO 5-6809 UN 9-1397 UN 4-4939

INFERNO
Safety Valves



MEET YOUR NEEDS

2" Safety "Pop" Valves in four different styles, designed to meet your specific safety needs. INFERNO Safety Valves can be used for steam up to 350 pounds or for oil, water and gas to 1,000 pounds. Set for lowest blow-down permitted under ASME code. Write for new Bulletin No. 32.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.
INFERNO

wall and outside paint, plumbing fixtures, kitchen accessories, insulation and roofing. **For more information write or call: Whitmor Homebuilders, Inc., Phone MA 6-1137, 5525 East Fifteenth Street, Tulsa, Okla.**

●

Mobile Bunkering Blender. Economic solutions to the many problems of bunkering-station operators, the foremost of which is to satisfy the various viscosity requirements imposed by ship's officers often with only a few hours advance notice, are described in a two-page bulletin. Complete with photos, diagrams, and descriptive information on the unit's operation and specifications, this bulletin tells how the Model SP-FR, Type VDB 2100-50 self-operated blender, provides continuous automatic on-the-spot stream blending directly to the ship from base stock storage tanks. **For more information write or call: Proportioneers, Inc., 345 Harris Avenue, Providence, R. I.**

●

A-C HD-6 Crawler Tractor. The technical and operating story of the 45 drawbar hp. HD-6 diesel-powered crawler tractor is now available. In a new two-color catalog, MS-461, engineering, design, and performance features are explained with the help of photographs and illustrations which are also used in reviewing the new diesel engine which powers the tractor. In addition to specifications, the catalog lists the full line of matched equipment and accessories. **For more information write or call: Allis-Chalmers Manufacturing Co., Tractor Group, Milwaukee, Wis.**

●

Jaroco Hydraulic Remote Control System. A newly patented hydraulic remote-control system for marine and industrial valves was designed to provide fast, safe, positive operation of valves located in areas or compartments containing toxic or explosive materials and for valves not readily accessible for direct manual operations. **For more information write or call: Jaroco Engineering Co., 158 Fourteenth Street, Hoboken, N. J.**

●

Packaged Water Tube Boilers for capacities to 50,000 lb. per hour are described in a recently revised 12-page catalog, 133-D. Interesting as well as informative, this new publication uses color and illustration to amplify the descriptive text. Complete data and dimensions are included for boilers ranging from 8,000 to 50,000 lb. of steam per hour, firing oil or gas or both. **For more information write or call: Superior Combustion Industries, Inc., 1475 Broadway, New York 36, N. Y.**

●

Bart Lectro-Clad Nickel-Plated Steel, a 12-page technical manual, presents a technical description of CF&I lectro-clad nickel-plated products covering manufacturing techniques and fabrication procedures, including forming, welding, cleaning, handling, and testing methods. Nickel-plated steel provides low cost protection against contamination and corrosion and has wide application in the oil, chemical, and petrochemical industries. **For more information write or call: Colorado Fuel & Iron Corp., 575 Madison Avenue, New York 22, N. Y.**

●

Precision Drive for Adjustable Speed Applications. New literature, Bulletin 4400-PRD-229, illustrates the new Ampli-Speed magnetic drive, which provides precise, adjustable-speed power for a wide range of applications. The four-page folder explains use of the drive for both fan-type (centrifugal fans, pumps, compressors) and constant torque loads (conveyors, mixers, etc.). Construction features are illustrated clearly. Pictorial drawings show the relationship of the drive to its magnetic amplifier control, the driving motor and driven load. **For more information write or call: Electric Machinery Manufacturing Co., Minneapolis 13, Minn.**

●

Process Plants by Blaw-Knox. Design, engineering, construction and initial operation of process-industries plants by the chemical plants division of Blaw-Knox Co. are outlined in a colorful, new catalog, Bulletin 2514. Illustrated with photographs of major projects, the brochure is designed to provide information on the diversity and scope of work undertaken and completed in the process-industries field. **For more information write or call: Chemical Plants Division, Blaw-Knox Co., Farmers Bank Building, Pittsburgh, Pa.**

●

General Analytical Method of Piping Flexibility Analysis. How processing and power-piping costs can be reduced substantially in materials, design and construction is the subject of a new 12-page brochure. This analysis involves the development and solution of simultaneous equations for determining forces and moments in the piping system. From these forces and moments, stresses and deflections are calculated. Since the analyses are not

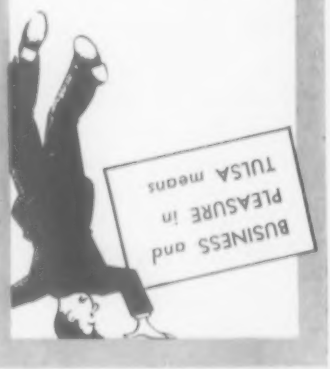
You don't have to read it this way to know it's *right!*...

THE MAYO

Tulsa's *world famous* HOTEL

Completely AIR-CONDITIONED

L.D. PHONE 381



DAMAGED?

NOT IF YOU SEE TULSA CRATING CO. BEFORE YOU SHIP

Why take a chance on losing money if your shipment arrives at its destination in a damaged condition. Let Tulsa Crating Company save you money when their specialists give your shipment experienced attention. Precision Engineered crates and packaging are used for both domestic and export shipping. Call us today.

TULSA CRATING CO.
519 SOUTH ROCKFORD — TULSA, OKLA.
Ph. Diamond 3-6482 • Diamond 3-3492

NEW STAINLESS STEEL PIPE

Approx. 804 ft. (29,587#) 14" OD–Sch. 10
$25.76 per foot

Approx. 2930 ft. (185,469#) 14" OD–Sch. 40
$37.98 per foot

Type 304, Welded, Plain Ends,
Extra Low Carbon
10 foot Lengths

Sch. 10–36.8# per foot–.250" wall
Accordance Mill Tolerances

Sch. 40–63.3# per foot–.437" wall
Accordance Mill Tolerances

Heat numbers on request

IMMEDIATE SHIPMENT

WRITE • PHONE • WIRE
William Fabrikant
WF STEEL PRODUCTS, INC.
Park Sheraton Hotel — Suite 2364
202 WEST 56th STREET
NEW YORK 19, N. Y.
Plaza 7-5622

based on approximations or shortcut calculations, it is possible to specify more closely to the theoretically perfect piping design, thereby avoiding excessive and costly margins of safety. **For more information write or call: Fabricated Products Division, M. W. Kellogg Co., 225 Broadway, New York, N. Y.**

•

Model J Vertical Treater. Catalog 31-05 covers the design of a vertical treater made to handle large volumes of oil, water, and gas on tough treating jobs. It contains all the high performance and easy operating features known to the industry. The catalog is fully illustrated with line drawings, including a four-color flow diagram on how the treater works. **For more information write or call: Black, Sivalls & Bryson, Inc., 7500 East Twelfth Street, Kansas City 26, Mo.**

•

Fundamentals of Instrumentation for the Industries. Sections of this 115-page book cover such subjects as: Fundamentals of measurement and control, measurement of process variables, remote transmission of measurements, types of automatic controllers, power units and final control elements, control systems, and panelboards. **For more information write or call: Industrial Division, Minneapolis-Honeywell Regulator Co., Wayne & Windrim Avenues, Philadelphia 44, Pa.**

•

Heat Exchanger and Condenser Tubes. A new eight-page technical folder identified as TB-329B covers pertinent information on all of the various popular grades of carbon, alloy, and stainless steel heat-exchanger tubing, both seamless and welded. The bulletin also includes a special section dealing with the problems of installing heat-exchanger and condenser tubes by the expanding method. **For more information write or call: Tubular Products Division, Babcock & Wilcox, 161 East Forty-second Street, New York, N. Y.**

•

New Rubber Lining Catalog. A new catalog of corrosion, abrasion, and contamination-resistant rubber linings for tanks, pipe, valves, and similar storage and process equipment is generously illustrated and contains many useful charts, tables and diagrams, along with specifications and suggestions covering tanks for the chemical, process, and plating industries. Although not intended as an exhaustive discussion of the subject, Catalog 7115 contains helpful suggestions for effecting econo-

SALESMANAGER WANTED

. . . by old established highly reputable St. Louis company, distributor of top quality, nationally-advertised lubricating oils and greases in large Mississippi Valley territory. Adequate experience a must. Age 30 to 50. Excellent growth opportunity for man with ability to take over vacancy created by death of former salesmanager. Ample starting salary with incentive bonus. Liberal pension and insurance benefits, plus profit-sharing.

Write in confidence for interview, and give complete personal data and employment history.

Box J-312, The Oil and Gas Journal, Tulsa, Oklahoma.

Today's most practical reference on . . . .

PROCESSING and DESIGN IN PETROLEUM REFINERY OPERATIONS

HERE'S a detailed, modern treatment of petroleum refining that covers all major aspects of refinery engineering—evaluating oil stocks, physical and chemical operations in processing, testing petroleum products in relation to service performance, and the economics and calculation of equipment design.

Petroleum Refinery Engineering

By W. L. NELSON

Consulting Petroleum and Chemical Engineer; Professor of Petroleum Refining, University of Tulsa

840 pages, 6x9, 179 tables, 268 illustrations, $10.50

THIS manual gives a step-by-step presentation of refining methods . . . revised and extended physical data . . . and practical details on plant operations in the light of today's costs. Typical of the up-to-date treatment is the inclusion of topics like catalytic cracking, solvent treating, mercaptan dissolving processes, azeotropic distillation, etc.

COVERS

- petroleum sulfur compounds
- ethylene manufacture
- evaluating diesel fuels and cracking stocks
- additive materials for heavy lubricating oils
- reboiling, etc., etc.

Oil and Gas Equipment
Reader Service Dept.
Tulsa 1, Oklahoma

Please send me Nelson's PETROLEUM REFINERY ENGINEERING, 3rd, revised ed.
☐ Check enclosed. ☐ Bill me.

Name.....

Address.....

City.....Zone...State.....

mies in the bulk handling of chemicals and a complete guide for the proper selection of lining for use with a wide variety of acids and alkalies. **For more information write or call: Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J.**

●

Worthite Self-Priming Centrifugal Chemical Pumps is the subject of Bulletin W-350-B13, which presents information on standard-end suction centrifugal stainless-steel pumps for tank car unloading, underground tanks, and numerous applications where air or vapor handling capacity is required. Major components such as priming mechanism, removable recirculation port, packing box and mechanical seal are informatively described. In addition to coverage charts for 60 and 50-cycle motor speeds, a dimensional outline drawing and sectional drawing with exploded view illustrations are also included. The new bulletin offers data on maximum interchangeability and coverage, minimum spare parts requirements, and reduced maintenance costs. **For more information write or call: Worthington Corp., Advertising & Sales Promotion Department, Harrison, N. J.**

●

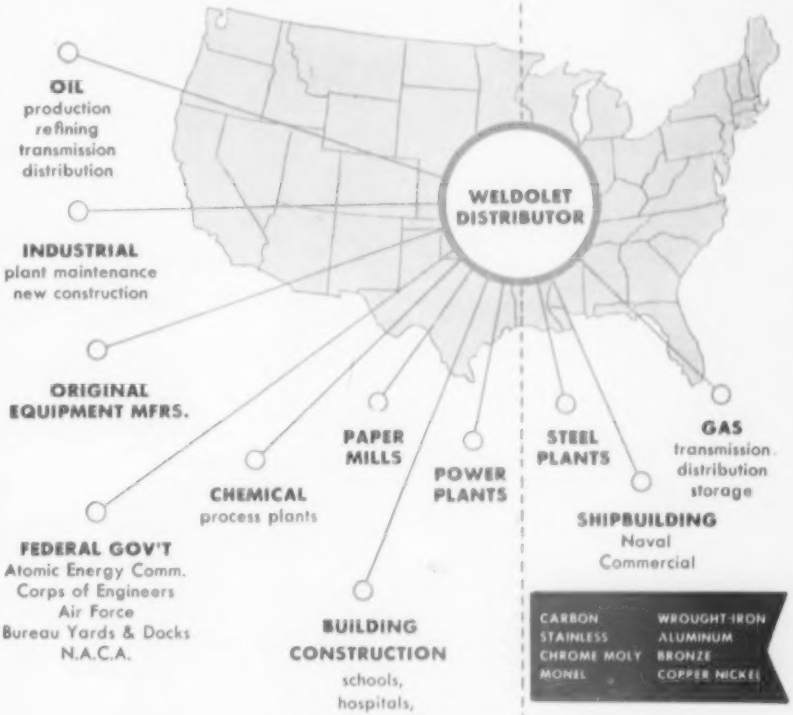
Totally Enclosed Oil Engines, 1,050 to 3,000 B.HP. describes the horizontal vis-a-vis design operating on the four-stroke cycle, having an equal number of cylinders, disposed on each side of a central crankshaft. Due to its design the engine does not encounter any disturbing critical period throughout its running range. **For more information write or call: Crossley-Premier Engines, Ltd., Sandiacre, Nottingham, England.**

●

Michigan Turbo-Dozer. More than 50 photographs arranged in film clip fashion illustrate the operation and correct application of the Turbo-Dozer in a new 20-page booklet, Bulletin 157. A running commentary or script alongside the photographs describes the operational features of this rubber-tired dozer powered by a turbocharged diesel engine. It explains how hydraulic controls facilitate easier maintenance, how the 2¾-yd. bowl can be tilted while the machine is in motion, and how the machine moves over the highways under its own power, at a speed of 27 m.p.h. Dimensional specifications are shown on side and overhead view drawings. Engine, power train, and hydraulic system specifications are also listed. **For more information write or call: Clark Equipment Co., Construction Machinery Division, Pipestone Road, P. O. Box 599, Benton Harbor, Mich.**

WELDOLET WELDING FITTINGS

serve the Nation's Industries



CARBON · WROUGHT-IRON · STAINLESS · ALUMINUM · CHROME MOLY · BRONZE · MONEL · COPPER NICKEL

WELDOLETS

THREDOLETS

SOCKET WELDOLETS

branch connections for any and all piping services

NOW AVAILABLE from leading warehousing distributors in all principal cities. Write for catalog W-4.

BONNEY

WELDING FITTINGS DIVISION

FORGE & TOOL WORKS

366 GREEN ST., ALLENTOWN, PENNA.

EQUIPMENT MEN . . . in the News

Union Steam Pump Makes Stevens Sales Manager

Union Steam Pump Co., Battle Creek, Mich., has announced the appointment of William A. Stevens as sales manager. Stevens has been with Union Steam Pump as sales consultant for 10 years. The general sales offices of the company are in Battle Creek.

Geophysical Service, Inc. Promotes Key Executives

Election of Cecil H. Green as chairman of the board and Fred J. Agnich as president of Geophysical Service, Inc., was announced recently by the GSI board of directors. Green was elected to the position formerly held by J. Erik Jonsson, who will devote his full time to duties as president of Texas Instruments, Inc., parent company of the TI-GSI organization.

Agnich becomes the principal executive officer of the geophysical exploration subsidiaries of Texas Instruments, electronics-products manufacturing firm. Green joined Geophysical Service, Inc., shortly after its organization in 1930. He has served as a party chief and field supervisor in both foreign and domestic operations of the firm and became president of GSI in 1950.

Agnich, also a director of Texas Instruments, Inc., formerly was executive vice president of GSI. He joined the staff of Geophysical Service, Inc., in 1937 as a recording helper, served as a seismic computer in the United States, South America, India, and Sumatra. He became chief of a field party in 1943 and was promoted to field supervisor in 1943. He became executive vice president of GSI in 1951.

Mid-Continent, Gulf Coast Changes Made by Oilwell

The transfer of Ivan A. Jones, district representative, from El Dorado, Kans., to Wewoka, Okla.; appointment of Frank James, Jr., as field representative at Pawhuska, Okla.; transfer of Raymond H. Miller, field representative, from Medicine Lodge to Ellinwood, Kans.; appointment of Mansel O. Holmes as field representative at Healdton, Okla.; and appointment of Robert B. Kennedy as store manager of the Russell, Kans., store were announced recently by Mark Barkhurst, Mid-Continent area manager of U. S. Steel's Oil Well Supply Division.

Changes announced by M. F. Jones, Gulf Coast area manager, include: the appointment of Thomas A. Hopkins as district representative at Pettus, Tex.; transfer of William A. Pratz, field representative, from Alice to McAllen, Tex.; and the transfer of John S. Purvis, field representative at Brookhaven, Miss., to New Iberia, La.

Jones was employed by Oilwell in 1948, and has served as district representative at Great Bend and Ellinwood. In 1950 he became store manager of the El Dorado store and in 1952 was named district representative, subsurface sales, at El Dorado. James was employed in 1952 at Oklahoma City. In 1953 he was transferred to Seminole, Okla., where he was located prior to his present appointment.

Miller was employed in 1948 at the El Dorado store, served as store manager at Stafford and Medicine Lodge, and in 1955 was appointed field representative at Medicine Lodge. Holmes was employed in 1952 at Healdton and was located there until his recent appointment. Kennedy was employed in 1949 at Ellinwood, served as store manager at McPherson, Kans., and Arkansas City, Kans., and in 1954 was appointed field representative at Russell.

Hopkins joined Oilwell in 1948, served as field representative at Victoria, Tex., and as store manager at Mirando City, Tex. Pratz was employed in 1952 at the Mission, Tex. store and in 1953 became field representative at Alice. Purvis was employed in January 1955 as field representative at Brookhaven.

PGAC Holds Annual Management Conference

Top executives of Perforating Guns Atlas Corp. recently met at Houston with the company's key management men from the general and branch offices for its annual management conference. Operations during 1955 were analyzed and plans completed for again expanding the company's logging, perforating and other services in 1956.

Paul Charrin, president, revealed that PGAC's business during 1955 had already resulted in capacity operations at the company's new 10-acre Houston main plant, opened last April. J. H. Castel, executive vice president of PGAC, reviewed the firm's recent research activities. He said, "Several of these new developments, after extensive and indisputable field tests, have already found fruition in new logging and perforating techniques and equipment recently put into operation by the company."

Among the top executives and key management men of Perforating Guns Atlas Corp. who attended the management conference shown here are a group from the Southwest area: seated, left to right: J. H. Castel, executive vice president; Ralph Davis, shop superintendent; George Decker, South Texas district manager; W. L. (Bill) Young, sales manager; and Al Kangers, Kansas district manager. Standing, Rush George, North Texas district manager; J. H. Russell, manager of operations; Harry Hacke, superintendent of operations; Jack Howse, Oklahoma district manager; Paul Charrin, president; Jack Henley, West Texas district manager; Floyd Taylor, South Louisiana district manager; C. C. Hinson, assistant to the president; Sarge Haynie, Ark-La-Tex district manager.

General Precision Acquires Shand and Jurs

An agreement has been reached for the acquisition by General Precision Equipment Corp. of a majority of the outstanding stock of Shand & Jurs Co., Berkeley, Calif., according to an announcement by Hermann G. Place, General Precision president, and Raymond M. Young, president and treasurer of Shand & Jurs.

A pioneer in the development of equipment related to the safe storage and transportation of volatile liquids, Shand & Jurs was organized in 1922. Developments in the field of electronic indication of storage-tank capacities made in recent years by S & J provide for liquid-level data, temperature information, etc.

Under terms of the acquisition agreement, 10,317 shares of General Precision cumulative preferred stock and 21,000 shares of General Precision common stock will be issued in exchange for all outstanding stock of Shand & Jurs except for 20 per cent of a junior preferred which will be exchangeable over a period of years for General Precision common stock.

Upon consummation of the acquisition, Shand & Jurs will join the General Precision group of operating companies but will continue to be operated as a separate corporation under the present management, according to Place. Officers of the company include: Albert E. Jurs, Sr., chairman of the board; Eugene E. Jurs, vice president; Albert E. Jurs, Jr., vice president, and Peter C. Jurs, vice president.

Grobholz Heads Worthington Power-Pump Sales Group

R. K. GROBHOLZ

R. K. Grobholz has been appointed manager of Worthington Corp.'s power-pump sales division with headquarters at the corporation's Oil City, Pa., works, according to a recent announcement by T. J. Kehane, vice president in charge of sales. Grobholz succeeds A. F. Welsh who has been appointed manager of the marketing research division.

In 1943 Grobholz joined Worthington as a test engineer and served successively as application engineer for steam pumps and then power pumps for 8 years. In 1952 he was appointed power-pump section leader, and in 1954 he moved his headquarters to Oil City as manager of the reciprocating-pump sales section, the position he held until his present appointment.

Los Angeles Nomads Induct Clark, Anderson

Two new members were inducted into the Los Angeles Chapter of Nomads at the regular dinner meeting in December. Flanked on the left by Bob Gaylord, of Wagner-Morehouse, Inc., sergeant-at-arms, and on the right by Harry Hester of McCullough Tool Co., induction master and vice president of the chapter, are: Ed Clark of Oilwell Supply Division, associate member, and Andy Anderson of Pacific Perforating Co., regular member.

Hambric Named to New Continental Post

Continental Supply Co. has announced the appointment of Roscoe O. Hambric to the newly created position of general merchandise manager. Since the latter part of 1954 he had served as assistant division manager of the Kansas-Oklahoma division, with headquarters in Tulsa.

In his new position Hambric will have headquarters in Dallas, the home office of Continental. He will supervise and direct the operations of the purchasing, material control, and traffic departments in the Dallas office and also will coordinate, in collaboration with divisional management, all divisional merchandising functions.

Hambric started with Continental in the Seminole, Okla., store in 1946. He has held positions as city salesman, store manager, assistant district manager, and district manager.

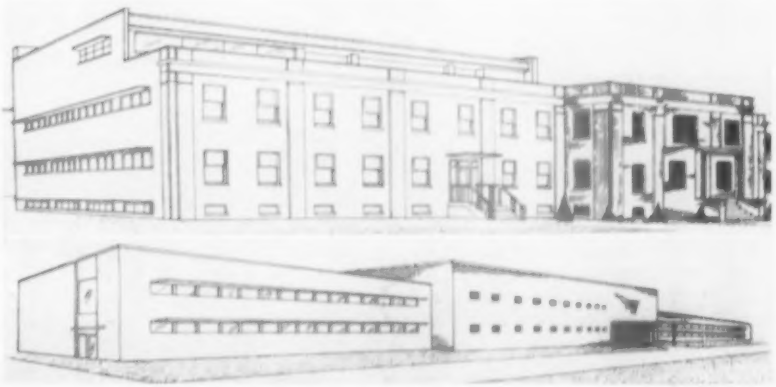
Halliburton to Add to Duncan Plant

Two major building expansions are being undertaken by Halliburton Oil Well Cementing Co. at its Duncan headquarters. Logan D. Campbell, vice chairman of the company, and L. B. Meaders, president, announce the start of construction on a four-story addition for Halliburton's main office building at Plant One.

The other major expansion is a new wing at the company's main Technical Center building, adjoining Halliburton Plant Two. Preliminary excavation work is already in progress on this.

The main office addition will increase by 28,000 sq. ft. the building's present 45,600 sq. ft. The Technical Center addition will add 19,020 ft. to the present 32,250-ft. area. A 200-seat auditorium comprising part of the two top stories, dining-conference room, and a large elevator are features of the main office addition.

"These projects mean we can enlarge our technical staff and rearrange office facilities at the office building," the Halliburton officials pointed out. "The continual expansion of our business dictated the need for both projects."



Top: New addition (left) at Halliburton's main office building. Adding 28,000 sq. ft. to the present building, it has the same reinforced concrete-brick exterior construction. Bottom: New wing (left) at Halliburton's Technical Center. When finished, it will increase the structure's working area by more than half the present area.

SAFE and SURE

GUIBERSON'S KVL PACKERS

Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost when specified.

With Automatic Latch

Operators who want extra assurance that a packer won't come unlatched going in, depend on Guiberson KVL packers. Rugged and durable, KVL packers have earned a reputation for dependable performance in deep and medium depth wells. These retrievable packers are easy to set and release, with ample bypass and positive seal. When running into a liner the KVL stays latched and drag springs provide an excellent guide — features operators like. For conserving gas energy and increasing production in flowing wells; for completing wells by circulation; for acidizing, repressuring and dozens of other uses, the KVL is unsurpassed.

- Made as the KVL30 with 30" valve stroke or KVL8 with 8" valve stroke for standard below-packer circulation. (Both packers also made with perforated mandrel for circulation above packer.) Available in casing sizes 5" through 9⅝".
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Rubbers made of special oil and gas resistant compound. Will not vulcanize to casing — recover original shape when released.

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

EXPLORATION

Year Opens With a Bang in North Dakota

by Frank J. Gardner

Three indicated discoveries in North Dakota have promised a lively exploration year ahead for the state. At A, Texota 1 Swenson; at B, Phillips & Ballard 1 Braathen; and at C, Calvert 1 O'Clair —all have had positive results on drill-stem tests since January 1.

IT was quite a week in North Dakota. The first week of 1956, that is. For in that short span of time, the state racked up three indicated discoveries, one-half as many as were recorded in the entire year before.

All three strikes are remote wildcats. Two are in previously unproductive counties. All are in the northwestern corner of the state. None is sensational. But the collective impact of this one-two-three punch may be substantial. It may be the prelude to a revival of wildcatting interest in North Dakota. Only 69 exploratory holes were drilled there in 1955, compared to 117 in 1954, a 40 per cent decrease in activity. But an increased success ratio of from 3 per cent in 1954 to 10 per cent in 1955 is of more than passing interest, and North Dakotans now predict a minimum 100 wildcats in 1956.

One . . . Curtain raiser on the 1956 discovery drama was Texota Oil Co. 1 Sarah Swenson, A on the map. Here in Section 22-163n-93w, 20 miles northwest of the nearest production at Coteau, operators set production casing after a drill-stem test of Mission Canyon-Mississippian at 6,206-41 ft. recovered 310 ft. of free oil, 810 ft. of heavily oil and gas-cut mud, and 30 ft. of oil-cut salt water. Two other tests recovered slight shows at 6,166-82 ft. and 6,244-74 ft. and the hole is being drilled deeper into Mission Canyon, topped at 6,190 ft. If successful here, Texota will give Burke County its second field.

Two . . . At B on the map, Divide County is promised its first field. Phillips Petroleum Co. and R. M. Ballard 1 Braathen (Section 29-162n-95w) ran initial swab tests and recovered 25 bbl. of oil along with 86 per cent water after perforating casing opposite Mission Canyon at 7,089-92 ft. An earlier test about 140 ft. up the hole near the top Mission Canyon had reportedly found recovery of 200 ft. of oil and 160 ft. of heavily oil and gas-cut mud with no water. Operators are expected to retest at that level. If this one comes in, it will be the most northwesterly field in the state, and will open up a lot of new territory to prospectors.

Three . . . The third contender for success also will add a new producing county to the list. At C on the map, in Ward County, Calvert Drilling Co. 1 Earl O'Clair (Section 15-160n-87w) recovered 615 ft. of clean crude in a Mission Canyon test at 5,788-5,820 ft. The 4-hour test had gas to surface in 1 hour and 40 minutes and breakdown of recovery recorded 135 ft. of clean brown oil, 360 ft. of heavily gas-cut mud and oil, 480 ft. of clean oil heavily gas cut, 50 ft. of heavily gas-cut oil and mud, and 10 ft. of water. Bottomed at 5,850 ft., this test also is going deeper to check lower zones and may reach the Lodgepole.

The O'Clair strike lies 50 miles northeast of Tioga field and about 15 miles equidistant from Coteau and Bluell fields, both 1955 hits of importance. It's a part of Calvert's drilling campaign on a 10-well farmout package deal from Stanolind Oil & Gas Co. The O'Clair is the seventh well on the list. The eighth, Calvert 1 Jacobson (Section 30-153n-84w, also in Ward County) is drilling now and should soon reach Mission Canyon testing levels. It lies 66 miles southeast of Beaver Lodge field and 50 miles southeast of the O'Clair well, in truly remote country. A strike here could well set the state afire.

Here is a reflection of past history in the oil business. Every time a new basin or a new province is opened to production, everybody rushes to the new Eldorado. Acreage is blocked by the township. Prices zoom. Royalties, rentals, and bonuses reach for the sky. But after the initial fever falls, and it becomes apparent that every acre is a risk, the rentals begin to pall. Farmouts begin to fall into the laps of adventurous wildcatters, and a new wave of success appears.

This is what is happening in Williston. Chances are that it will continue, and as it does, we shall see an upsurge in exploratory wells throughout the basin. The routine thinking that binds exploratory drilling will give way to new and daring ideas sponsored by venturesome independents. And discovery will result.

Will provide the key . . . Developments like these are the stimulants needed to entice more wildcat money into North Dakota and into the entire eastern two-thirds of the Williston basin. The few successes scored in 1955 attracted wide attention and these three new ones of 1956 will no doubt stir up enough new interest to turn the trick if they are all commercial. North Dakota's 80 per cent increase in production during the year just closed reflects the maturity of the oil industry there. This, with the needed exploration luck, should convert the state from a lame-duck hunting ground into a real rig magnet. It's only a matter of one-two-three.

Fig. 1—An outline of the Tejon Embayment, southeast portion of the San Joaquin Valley.

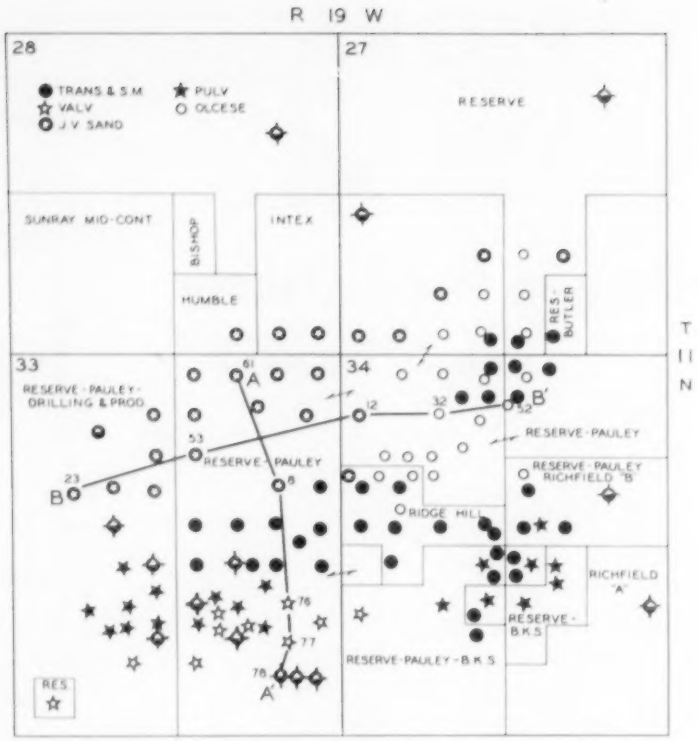


Fig. 2—Here is the central portion of California's highly active Tejon-Grapevine field.

Here's a review of 18 busy months spent . . .

Developing California's Tejon-Grapevine Field

by J. P. Lavery, Jr.

ONE of the most active areas in California during the past 18 months has been Tejon-Grapevine field. Located in the extreme southeasterly portion of the San Joaquin Valley, it is north of the Tehachapi Mountains and west of the Sierra Nevada Mountains.

The mountainous areas consist of Jurassic basement rock with a border of Pleistocene to Eocene sediments exposed between base and valley alluvium. The forces that uplifted these mountain ranges, nearly at right angles to each other, developed complex fault patterns and numerous unconformities.

Three areas . . . Tejon-Grapevine field is divided into three distinct areas of production: the western area; the central area; and the eastern area. Practically all current production in the western and eastern areas is from Transition zone sands (Fig. 1).

This paper deals mainly with the central area which now has six major producing zones — Transition, Santa Margarita, Pulv., Valv., Olcese, and JV sands.

During the past 18 months, 59 wells were drilled in the central area. Of these, 55 were completed and 4 were abandoned. Of the producers, 2 were completed as new zone discoveries and 1 as a new pool discovery. The new zones were discovered by deeper exploration when the original intended zones of completion were found to be nonproductive. Development of the recent discoveries increased oil production from 1,285 bbl. per day from 56 wells in May 1954, to 8,360 bbl. per day from 111 wells in October 1955.

Fig. 2 shows the distribution of production and the number of wells in each zone. There are 36 Transition and Santa Margarita wells, 20 Pulv. zone wells, 10 Valv. zone wells, 22 Olcese wells, 1 Freeman zone well, and 23 JV sand wells.

. . . The Upper Miocene transition zone sand ranges from 2,600 to 2,800 ft. in depth with productive intervals from 50 to 120 ft. Permeabilities vary from 0 to 1,200 md. Gravity of the oil is 16° to 18° A.P.I. The structure is a gentle fold plunging slightly to the west. Permeability governs the trap in some portions of the area, especially to the east. No gas cap is found in the main sand, but upper stringers apparently contain gas over the entire productive area.

A new Transition pool was discovered in December 1954 in 41A-34 Reserve-E. W. Pauley. Nine wells now produce 18°-gravity oil from a depth of 2,800 ft. This pool is apparently not con-

Author is with Reserve Oil & Gas Co. Paper presented before the 1955 annual meeting of Pacific Coast Section of A.A.P.G., Los Angeles.

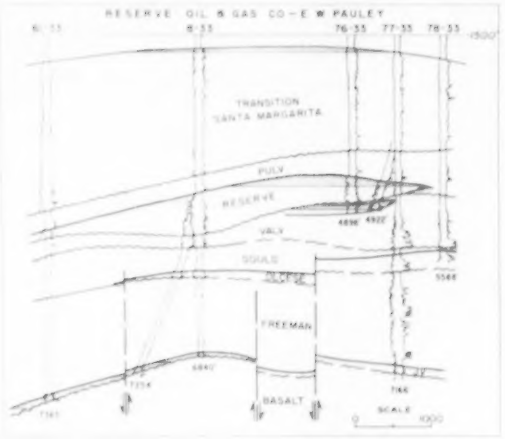


Fig. 3—North-south section of 61-33, 8-33, 76-33, 77-33, and 78-33 Pauley wells in Tejon-Grapevine field.

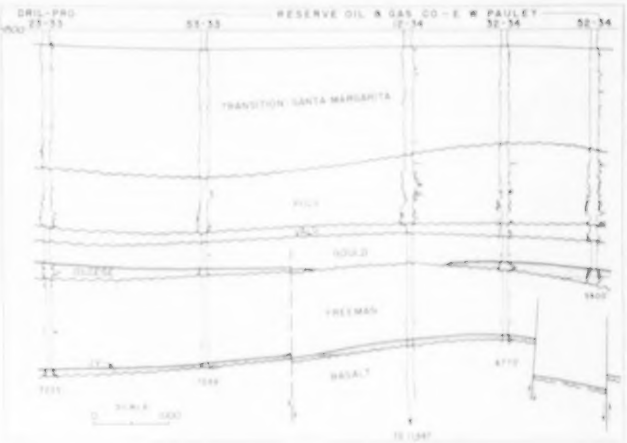


Fig. 4—East-west section from 23-33, 53-33, 12-34, 32-34, and 52-34 Pauley wells in Tejon-Grapevine field.

nected to other Transition pools and the trap appears to be one of permeability.

. . . Santa Margarita wells range in depth from 2,700 to 2,900 ft. with a productive interval of 60 to 150 ft. This sand, yields 18°-gravity oil. The trap is partly stratigraphic, with gentle folding, and no gas cap.

. . . The Pulv. Zone, Lower Mohnian, ranges from 3,000 to 4,600 ft. and consists of shale and sand members, the most productive of which is the Reserve sand. This was the first productive sand in the area. The thickest portion of the sand occurs on the axis of a narrow anticline which plunges to the west. The section thins on the north flank and the sand shales out on the south flank (Fig. 3).

. . . The Valv. Zone has one productive sand (Luisian) about 80 ft. thick at a depth of 4,700 ft. First production from this sand was obtained in January 1952. It yields 33°-gravity oil. Initial productivity indices ranged from 0.5 to 1.5 bbl. per day per psi. An active water drive as well as an expanding gas cap provide the reservoir energy. The structure is an east-west fold with the sand shaling out on the south flank.

. . . The Olcese pool was discovered in May 1954 in 42-34 Reserve-E. W. Pauley. The Olcese is a basal Relizian sand and conglomerate. The gas cap consists of thinly interbedded sands and shales about 150 ft. thick. The oil reservoir consists chiefly of conglomerate with a medium-grained, well-sorted, crisp, clean, oil-sand matrix. It varies from 40 to 170-ft. thick at an average depth of 5,650 ft. Permeabilities vary from 0 to 2,000 md., gravity of the oil is 28° to 30° A.P.I., and initial productivity indices varied from 0.3 to 2.5 bbl. per day per psi.

An expanding gas cap as well as an active water drive on the north flank provide the reservoir energy. The Olcese structure is a NE-SW trending anticline which is faulted on the south flank. A rapid facies change is exhibited by the Olcese conglomerate being thickest on the NE nose, thinning to thin sands on the north flank, then shaling out on the crest and becoming sandier again to the west (Fig. 4).

. . . The JV sand was discovered in December 1954 in JV 33-33, drilled jointly by Drilling & Production Co., Reserve Oil & Gas Co., and E. W. Pauley. This Saucesian sand overlies basalt throughout Tejon-Grapevine field. It is 45 to 100 ft. thick at depths of 6,600 to 7,400 ft. with a gas cap of 15 to 20 ft. covering an area in excess of 100 acres. Permeabilities range from 3.5 to 5,000 md., gravity of the oil is 35° to 39° A.P.I., and initial productivity indices ranged from 0.3 to 24.7 bbl. per day per psi. The structure is a NE-SW trending anticline. Production is limited on the south by a pre-Olcese thrust fault. Productive limits to the west have not as yet been established (Fig. 5).

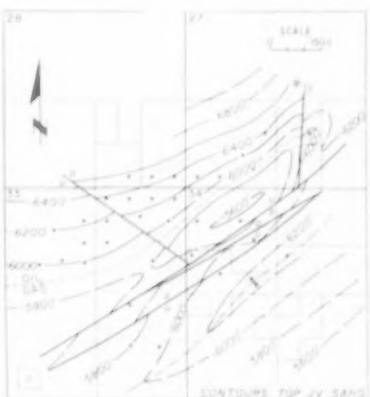


Fig. 5—Contours are drawn on top of the JV sand in the central portion of Tejon-Grapevine field.

Ridge Hill Oil Co.'s 10 Schoettler, located on the south flank of the JV fold in Section 34, had no Olcese sand in the Relizian section and the JV sand was tight and gassy. Production, however, was obtained from a stray Freeman sand of Saucesian age which appears to have a very limited areal extent.

Deeper beds . . . Below the JV sand lies a Saucesian volcanic section of 1,400 to 1,800 ft. thick. It consists of basaltic detritus, basalt flows, ash beds, and occasional sand fingers. The thickest known section underlies the JV and Olcese fold in the central area. Present evidence indicates the volcanic section to be mainly flow-type material, but there are some intrusives in outcrop.

The sediments below the volcanics have not as yet been intensively explored. But they are productive in other areas nearby, such as Tejon Hills, Wheeler Ridge, and Edison.

Three wells have established the presence of Eocene at a depth of about 12,000 ft. The Eocene section consists of about 1,300 ft. of shale with one or two prominent sand members.

Underlying the Eocene is a Jurassic basement complex consisting of schists, phyllites, and granites. Basement rises from about 15,000 ft. in Tejon-Grapevine field to 3,000 ft. in the Tejon Hills 6 miles to the east.

Much of the future exploration will undoubtedly be aimed at testing the thicker sand sections found below the basalt.

EXPLORATION HIGHLIGHTS

GREAT LAKES

MICHIGAN

Second Traverse oil producer, first since the discovery well completion in this shallower horizon, appeared assured for the Reynolds Dundee-Reed City zone oil pool, Montcalm County at McClure, Swan-King, Basin Oil Co. and G. Ackerman 2 Long estate, SE SW SE 1-12n-10w, the south 40-acre offset to the Traverse rework discovery well.

Top of Traverse lime was logged at 2,776 ft., and oil and gas pay showed at 2,778 ft. where hole filled 800 ft. with free oil in 12 hours; a hole full of oil, ready to flow, in 50 hours. No water was in evidence. Operators planned to run 5-in. casing on a packer at this point, test and complete this week in the Traverse. A twin offset may be drilled to the Reed City zone pay at a later date.

First Detroit River oil producer to follow the L. Zellman 5 B. Zellam, Salem Township, Allegan County, was completed this past week at the Ford Oil Co. 1 Graczyk, NW SW NW 30-4n-12w, Dorr Township, Allegan County, the east 20-acre offset to discovery producer. New well was completed good for 15 bbl. of oil and 3 bbl. of water a day natural. Hole was bottomed out at 2,098 ft. but was plugged back to 2,096½ ft. in an effort to shut off water sand. Well may be acidized at a later date. Two other active drilling operations were in progress in the area, at the west and southeast 20-acre offsets, while Ford Oil Co. was moving tools for immediate drilling to the southeast 20-acre offset to this new completion.

● First 1956 discovery for Michigan went into the records this week with the completion of John W. Johnson 1 Clemons, SE NW SE 16-9n-9e, Marathon Township, Lapeer County, a Berea sand oil well rated good for 10 bbl. of oil and 30 bbl. of water after a sand fracturing treatment at 1,467 ft.

APPALACHIAN

EASTERN KENTUCKY

Kentucky West Virginia Gas Co. have successfully deepened 6191 Samuel J. Elkins from old total depth of 1,915 ft. to a new total depth of 3,666 ft. Located on Elkins Fork in Pike County, well formerly produced from the Mississippian Maxon sand. Drilling deeper uncovered Big Lime at 2,072 ft., Berea 2,782 ft. and Devonian brown shale 2,897 ft. to total depth. The shale section produced 381,000 cu. ft. of gas natural with a 120 lb. rock pressure in 172 hours.

In Martha pool, northwestern Johnson County, Ashland Oil & Refining Co. have completed 46 Jesse Lyons as a 15-bbl. per day pumper from the Mississippian Weir sand at a total depth of 757 ft. In the same field, 9 W. L. Gillem has been completed for 2 bbl. of oil daily at a total depth of 964 ft. in the Weir sand.

OHIO

Wayne Moore et al completed as a gasser a semi-wildcat on 1 (2) Paul Campbell, Section 1, Hopewell Township, Perry County. Clinton sand logged at 3,015-56 ft., gaged 900,000 cu. ft. natural with 950 lb. pressure.

● George Sheaf & Co. struck shallow gas in a test on 1 (3) J. A. Roberts, Section 34, Penn Township, Morgan County. Injun sand was topped at 980 ft., drilled 1 ft. in and gaged 2,600,000 cu. ft. natural.

● Mid East Oil completed two producers in Flint Ridge field, both outside locations, on the Charles Pharis tract in Section 8, Hopewell Township, Licking County. The No. 5, with Clinton at 2,980-3,021 ft. gaged 250 bbl. and the No. 6 with sand at 3,035-67 ft., gaged 90 bbl. in 24 hour tests after fracturing.

WEST VIRGINIA

In Union district, West Virginia, Delaware Gas Co. announced 1 Atlas Engineering Co., wildcat, elevation 1,105 ft., Phillipi Quadrangle, 3.35 miles south of latitude 39 degrees 10 minutes and 1.20 miles west of longitude 80 degrees 10 minutes.

● Dry Fork district, Randolph County, Ben Franklin Oil & Gas Corp. located 1 H. R. Tingler, elevation 2,914 ft., Horton Quadrangle, 1.1 miles south of latitude 38 degrees 55 minutes and 2.2 miles west of longitude 79 degrees 35 minutes.

● St. George district, Tucker County, Columbian Carbon Co. suspended operations in 1219 U.S.A., at 4,509 ft., after unsuccessful results in fracturing the Oriskany sand and will await completion of 1215 U.S.A., which is drilling at 5,658 ft.

PENNSYLVANIA

Young Township, Indiana County, Southwest Pennsylvania, Manufacturers Light & Heat Co. is at a depth of 1,026 ft. in 4336 Stewart and R. & P. Coal Co. Banks Township, Columbian Carbon Co. has rigged up the rotary outfit at 1831 Farmers & Miners Trust Co., and is ready to resume drilling.

MID-CONTINENT

OKLAHOMA

West Short Junction Extended One Mile East

Cleveland County's West Short Junction field has been moved 1 mile east at Ohio Oil Co. 1 Owens, C SW SE 13-10n-4w.

The extension discovery well flowed 489 bbl. of oil per day on ½-in. choke from perforations in the Bois d'Arc at 7,837 ft.

The northwest side of the field has been moved ⅝ mile by Stanolind Oil & Gas Co. That company's 1 Muzny, C SE NW 8-10n-4w, flowed at the rate of 724 bbl. per day from perforations at 8,247-55 ft. on ¼-in. choke.

KANSAS

Lansing Discovery Indicated In Northwest Stafford Area

Lewis Drilling Co. is running casing at a Lansing discovery well in the northwest part of Stafford County on the Central Kansas uplift. The 1 Shepherd, SW NE NE 10-21s-14w, 1¼ miles southeast of South Prichard pool and 5 miles northwest of Seward, Kans., tested the Lansing at 3,474-85 ft. Recovery was 2,135 ft. of oil and 120 ft. of oil-cut mud.

NORTH TEXAS

Montague Wildcat, Grayson Extension Well Completed

Southeastern Montague County gained a new conglomerate pool at Mendota Oil Co. and Standard Oil Co. of Texas 1 Lillie B. Jones, in Subdivision 9, Calhoun CSL Survey, A-121. Initial potential through ¼-in. choke

Index to area reports

Great Lakes	154
Appalachian	154
Mid-Continent	154
Hugoton Embayment	155
Oil's Northern Dominion	156
Pacific Coast	157
S.E.P.M.'s New Prexy	158
Ark.-La.-Tex.	160
West Texas-New Mexico	161
Gulf Coast	161
Western Canada	162
Book Review	162
Rocky Mountains	164
Successful Wildcats	169
Southeastern States	164

was 216 bbl. of 35° oil, under tubing pressure of 400 psi., and with gas-oil ratio of 450:1, from conglomerate pay at 6,804-14 ft. Location of the new producer is 3½ miles southeast of production, and 6 miles southwest of the town of St. Jo.

Grayson County . . . Nortex Oil & Gas Corp. 1 Shannon, ¾ mile northwest of Mackoy-Strawn field, has been completed as a pumping well. On 24-hour test it gaged 147 bbl. of 29° oil from perforations at 4,582-92 ft., after fracturing with 6,000 lb. of sand and 6,000 gal. of acid.

Southwestern Grayson County gained a new 7,000-ft. exploration at J. S. Batson and Sher-Tex Drilling Co. 1 T. P. Roach. Location is in the J. S. Thom Survey, A-1189, on an 810-acre lease, 11 miles southwest of Sherman.

Nortex Oil & Gas also completed a south extender to the Mulder-Ellenburger field. Their 1 R. L. Badgett, in J. Barefoot Survey, flowed 140 bbl. of 45° oil from perforations at 7,705-15. Gas oil ratio was 1000:1.

Young County . . . A Caddo limestone discovery was completed 8 miles northeast of Graham at Kenneth J. Rich and Wesley Stephens 2-A Johnson. Potential was 152 bbl. of 42° oil a day through 16/64-in. choke, from pay at 4,048-56 ft. Gas-oil ratio was 800:1. Tubing pressure was 200 psi. The well was originally filed at 1 Hazel Shanafelt. Location is on the Shanafelt lease, in TTRR Survey, A-1547.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Morrow Oil Stake Completed in Meade

Lion Oil Co., a division of Monsanto Chemical Co., has completed as an oil discovery the 1 Shinogle in Meade County, Kansas.

The 1 Shinogle, in the SW¼ NW¼ SE¼, 20-33s-29w, is located 1,650 ft. south and west of 1 Singley, which Lion completed as a gas discovery in mid-October. The 1 Shinogle flowed oil at the rate of 300 bbl. per day from the Morrow sand. Lion Oil Co. owns a 50 per cent interest in these two wells and in 1,600 acres in the immediate vicinity.

OKLAHOMA PANHANDLE

New Oil Discovery Hinted In Southern Beaver Area

A new oil pool is indicated for the Elwood area of south-central Beaver

(Continued on page 157)

WECO

the union you can trust for sealing and service . . .

on production hook-ups

The semi-permanent nature of connections on separators, treaters, tank batteries, etc. requires a union you can trust to hold a seal for a long time. **WECO** Unions are ideal for this service. Their famous ball and cone seat forms a positive leak-proof seal — assures you long-lasting, trouble-free service on flow lines and production hook-ups. Wherever unions are needed, you are way ahead with **WECO** — the union you can trust for sealing and service.

F-15-55

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

Oil's Northern Dominion

Western Canada's Oil Potential—695,000 Bbl. Daily

Crude-Oil Reserves—3¼ Billion Bbl.

Active Rigs—251

Gas Reserves—22 Trillion Cubic Feet

Geophysical Crews in Operation—156

Western Canada Looks Confidently Ahead

WESTERN Canada's proved oil and gas reserves, and ability to produce, continued to climb rapidly during 1955, pushed along by an exploration and development program of record proportions. With the intensity of exploration to date in the west only a small fraction of that reached so far in the great United States oil and gas regions, continued expansion of reserves and potential is assured for many years ahead, provided there are the incentives of adequate markets, fair prices, and equitable taxation and land policies.

By the end of 1955, Western Canada's oil potential (that is, its M.E.R., or maximum efficient rate of production) had climbed to an estimated 695,000 bbl. per day, an increase of about 25 per cent in the year. At the time of Leduc's discovery in 1947, Western Canada's M.E.R. was only about 20,000 bbl. daily. The current potential is dominated by Alberta with an estimated 625,000 bbl. daily. Saskatchewan is second with about 50,000 bbl. daily; Manitoba, third with 18,500 bbl. daily; and the Northwest Territories fourth with about 1,500 bbl. daily.

At year's end, only about 57 per cent of potential was being utilized, with December's production running about 394,000 bbl. daily. Of this, Alberta wells were providing about 342,000 bbl. daily; Saskatchewan 37,000 bbl.; Manitoba about 14,200; and the Northwest Territories 650 bbl. daily.

Proved reserves . . . The west's proved crude oil reserves at the end of 1955 stood at a record 3¼ billion barrels, according to estimates. New discoveries and further evaluation of earlier discoveries added a record 665,000,000 bbl. to known reserves during 1955. After deduction of the year's production (nearly 129,000,000 bbl.), the net increase in proved oil reserves was some 537,000,000 bbl., making current reserves about 3,240,000,000 bbl.

. . . Alberta leads with current proved oil reserves of about 2,870,000,000 bbl., after a net increase of about 450,000,000 bbl. for the year. **Saskatchewan** now has some 300,000,000 bbl. of proved reserves, up about 75,000,000 bbl. net for the year. **Manitoba** now has about 45,000,000 bbl. proved reserves, up 12,000,000 bbl. for the year. **The Northwest Territories** has now about 25,000,00 bbl. proved, with no additions during the year. The proved reserves do not take into account Alberta's famed Tar Sands, estimated to contain some 200 billion barrels of bitumen, more than the entire world's known reserves of crude oil.

Gas reserves . . . Western Canada's natural gas reserves increased about 2 trillion cubic feet.

This current reserve is dominated by Alberta, with about 18 trillion cubic feet. British Columbia is second with about 3 trillion cubic feet, and Saskatchewan is third with about 1 trillion cubic feet. Further evaluation of a substantial number of recent gas discoveries will, during 1956, increase the proved reserves, as will the continued discoveries of new fields in the west. Gas reserves are expanding far faster than production, which in 1955 amounted to 163 billion cubic feet.

Active rigs . . . At year's end, the number of drilling rigs in operation was at a peak of 251, of which 96 were on wildcats and 155 on field wells. Alberta has 173 rigs busy, Saskatchewan 49, Manitoba 18, British Columbia 9, and the Northwest Territories 2. At year's end 156 geophysical parties (148 seismic, eight gravity meters) were working. Of these, 108 are in Alberta, 23 in Saskatchewan, 1 in Manitoba, 22 in British Columbia, and 2 in the Northwest Territories.

Well completions . . . Western Canada had 158 discoveries in 1955 compared with 182 in 1954, but well completions totaled 2,879 during the past year compared to 2,201 in 1954.

Alberta led the western provinces with 98 discoveries, which is down 30 from the previous year. Saskatchewan was next with 41 discoveries and that is an increase of 6 over 1954. Manitoba had 9 new pool strikes, the same as in 1954. British Columbia had 4 dry gas strikes and 5 gas-condensate discoveries. The Northwest Territories scored 1 new gas field.

The New Year's Prospects

Exploration in Western Canada will likely set new records in 1956. Alberta will see an increase in Foothills ex-

ploration. The big Mississippian oil-producing area building up in the Sundre-Harmatton, and Westward-Ho area will be one of the most important development stories of the new year.

Saskatchewan holds a distance advantage of over 500 miles when compared to crude shipped from the western terminus of the Interprovincial pipeline, and is in a very favorable position with regard to marketing both in Eastern Canada and the north-central portion of the United States. At year's end plans for a pipeline to serve the many fields in this province were well under way. This pipeline factor will be a big boon to development and exploration in Saskatchewan.

The green light that was flashed late in the year for the Westcoast Gas Transmission Co.'s gas line from Peace River to connect with the system of Pacific Northwest Pipeline Corp. at the International Boundary, will eventually mean more exploration and development drilling for British Columbia. There will not be any great increase in British Columbia this year due to the fact that sufficient gas reserves, to meet early demands of the line, have been proved. 1957 will be the year for British Columbia.

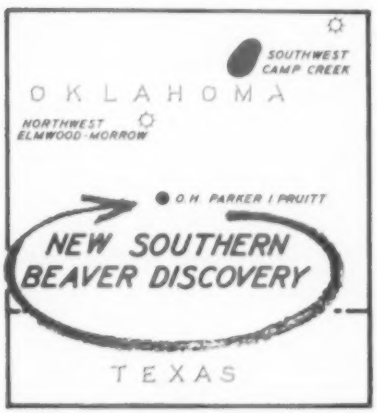
OKLAHOMA PANHANDLE

(Continued from page 155)

County in the Oklahoma Panhandle. Successful completion of Orville H. Parker's 1 Pruett in C SE NW 30-2n-24eCM would give the county its first 1956 discovery.

The well shows some gas, natural, on test of perforations in the Thirteen Finger lime at 7,464-68 and 7,472-80 ft. Following treatment the well returned load oil and swab-tested 49 bbl. of oil in 12 hours through tubing. The tubing was pulled and a swab run kicked off 100 bbl. of oil in 100 minutes through casing. Part of this flow was possibly load from the annulus.

The operator first perforated the Morrow sand at 7,604-28 ft. This zone failed to produce after treatment.



Orville H. Parker has a Thirteen Finger lime oil discovery well at 1 Pruett in C SE NW 30-2n-24eCM, Beaver County. This is the first discovery of 1956 for the area.

PACIFIC COAST

CALIFORNIA

New Gas Field Discovery

Gene Reid Drilling, Inc., has completed 1 Capital Co. for a new gas field discovery in the Willows area of Glenn County. This discovery, which has been shut in, is located 6 miles southwest of the Beehive Bend field and 5 miles northwest of Princeton field. The well, NE NE 5-18n-2w, flowed 800 M.c.f. of gas through a 12/64-in. choke on a test of the interval 5,933-85 ft. The shut in tubing pressure was 2,650 psi.

New South Mountain Pool Discovery

Union Oil Co. has scored what appears to be an important new pool discovery with 1 Texas-Union-Richardson-Earl in the Bridge area of South Moun-

competition *makes it better!*

Competition makes everybody sit up and take notice . . . makes the customer open his eyes to new benefits . . . makes business search for new approaches. There's no doubt that competition makes oil well cementing service better. On your next job call in the company that keeps the business going ahead with fresh advances in services and equipment.

Engineered answers to oil well cementing

BJ SERVICE, INC.

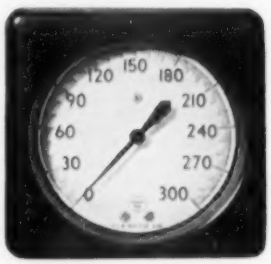
an ACCO product

Helicoid Gages

Why HELICOID is the Quality Gage for every pressure indicating service

Acaloy Case Helicoid Gage
Suitable for tap water, steam, inert gases, oils, coal gas and many chemicals.

Helicoid Chemical Gage
Suitable for chemicals and other viscous liquids which might corrode or clog Bourdon tube.



Acaloy Square Flush Case
This is a weather-proof case and ideal for use in symmetrical panels.

Built RIGHT

Exclusive HELICOID gearless movement. Bourdon tubes of maximum endurance life. Gives highest degree of *sustained accuracy*.

Stay RIGHT

No gear teeth to wear out. Convenient external pointer adjustment. Protected from sudden overpressure or pressure reduction.

Sold RIGHT

Experienced HELICOID gage engineers are available to help you choose the gage you need. Distributors are conveniently located. Write for the name of the one nearest you.

ACCO

Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-A Connecticut Avenue • Bridgeport 2, Connecticut

for Better Value

tain field, Ventura County. On a production test the well pumped 75 bbl. daily of 33°-gravity crude. The producing interval, 7,211-7,720 ft., is in the Pico formation beneath the Oakridge fault. Union has a joint interest in a 500-acre block on which the discovery is located plus substantial acreage in the trend area.

Offshore Core Hole Completed

Richfield Oil Corp. has completed and abandoned the first "no dope" core hole drilled from the small core boat "LaCienca" on its tidelands lease offshore from Rincon, Ventura County. The first hole was taken to 2,500 ft. Richfield's larger core boat "Rincon," a converted LSM, is expected to go into operation by the end of the month.

Drilling Boom Continues At Sunset Heights

The drilling boom at Sunset Heights area of Sunset Beach field continued to roll along. At last count 21 rigs were operating in the townlot area. However, the four latest completions in the 7,800 ft. pool failed to come in at the 2,000 bbl. rate typical of the first wells in the deeper pool.

Completions southeast of Superior Oil Co.'s discovery well, 2-1 Holbrook-Isabell-Howard, have been considerably below other offsets in the pool. Two such southeast completions last week brought in for 141 bbl. and 168 bbl. respectively.

However, two other development wells west and northwest of the discovery were completed at rates nearer those of the original wells in the pool. Jack B. Crawford completed 26 Well flowing 610 bbl. daily of 29°-gravity crude from the interval 7,880-7,635 ft. This well is 750 ft. northwest of the discovery. About the same distance west of the discovery, Harry J. Hill completed 2 Golden West-Supervisors in the interval 7,744-7,940 ft., flowing 550 bbl. daily.

Rains Hit New Area

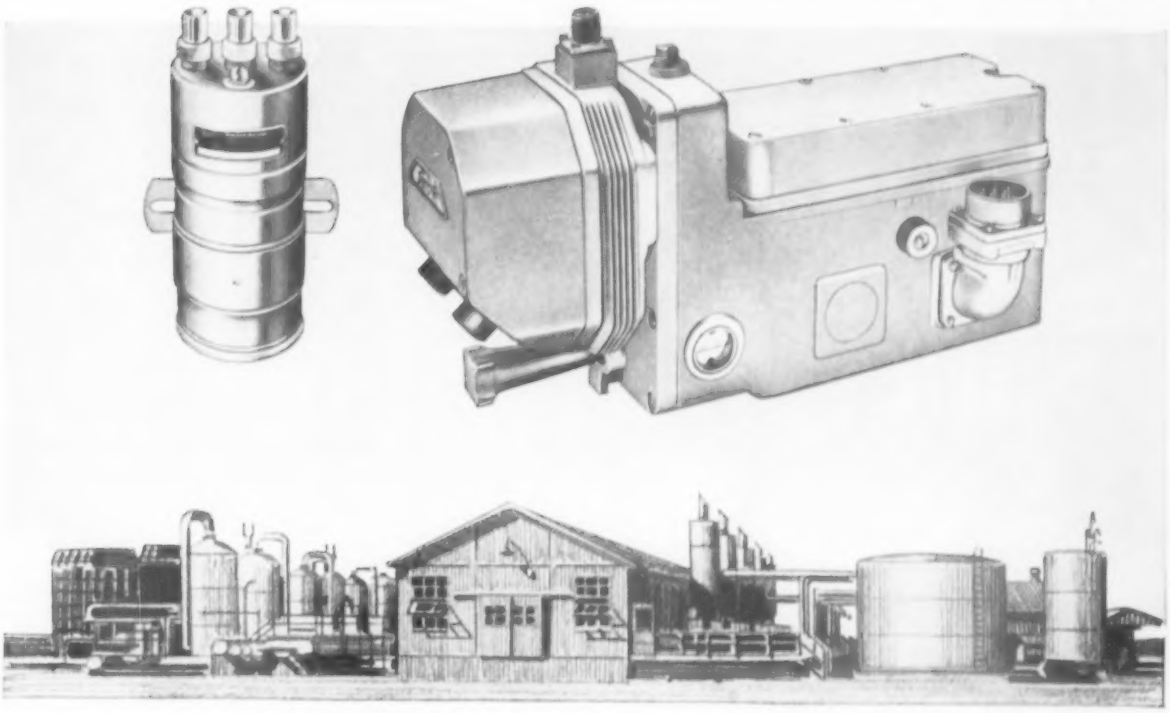
The recent torrential rains in northern California, with the resultant floods, have disrupted operations in Union Oil Co.'s new Oil Creek area in San Mateo County.

Shrock New S.E.P.M. President

Robert R. Shrock, professor of geology, Massachusetts Institute of Technology, Cambridge, Mass., will become

Bendix —*the most trusted name in ignition*—

Presents a New Matched Ignition System



Designed Specifically for the Petroleum Industry

OUTSTANDING FEATURES

Long service life

No unscheduled ignition shutdowns

High voltage output

Matched ignition components

Flame proof

The Bendix* LC Magneto has been engineered to meet the exacting requirements of the modern high-compression gas engines so widely used throughout the petroleum industry.

Because the Bendix LC is a completely new type of magneto, it incorporates the latest developments in materials, engineering, design and production techniques. The result is a matched ignition system—LC Magneto plus Bendix Hi-V Transformer Coils—that delivers ample voltage with greatly reduced maintenance costs.

For engines of 6 to 16 cylinders where top performance is a must, the new Bendix LC Magneto is the logical choice.

Complete descriptive folder is available on request.

*TRADE MARK

SCINTILLA DIVISION, BENDIX AVIATION CORP., SIDNEY, N. Y.
Export Sales and Service: Bendix International Div., 205 East 42nd St., New York 17, N.Y.

FACTORY BRANCH OFFICES

117 E. Providencia Avenue, Burbank, California • 512 West Avenue, Jenkintown, Pennsylvania • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan • 5906 North Port Washington Road, Milwaukee 17, Wisconsin • American Building, 4 S. Main St., Dayton 2, Ohio • 8401 Cedar Springs Road, Dallas 19, Texas • Boeing Field, Seattle 8, Washington • 1701 "K" Street, N. W., Washington 6, D. C.

Bendix
SCINTILLA DIVISION

Bendix
AVIATION CORPORATION

INFERNO

... the Safest High Pressure Gage in the World

Gage glass in Inferno gages is 1" thick, specially tempered and heat treated. This glass is held in the gage by equal pressure on both sides around the entire edge of the glass. The body is available in 3 different metals, and is machined from solid bar stock. Write for new Bulletin No. 33.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.
INFERNO

INCREASE PRODUCTION

CLEAN OUT CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less down-time, use world famous Miller Sand Pumps.

Write for descriptive price list.

SAND PUMP SIZES IN STOCK
O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 in.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3369

MILLER SAND PUMPS

MILLER SAND PUMP CO.
General Offices, Box 4516
Oklahoma City 9, Okla.
EXPORT OFFICES
30 Rockefeller Plaza
NEW YORK 20, N. Y.

president of the Society of Economic Paleontologists and Mineralogists on April 26, 1956. Serving with Shrock on the 1956-57 council will be F. J. Pettijohn, Johns Hopkins University, Baltimore, Md., as past-president; Richard V. Hollingsworth, Paleontological Laboratory, Midland, Tex., as vice president; Samuel P. Ellison, Jr., University of Texas, Austin, Tex., as secretary-treasurer; W. M. Furnish, Iowa State University, Iowa City, Iowa, as editor of the Journal of Paleontology; and Jack L. Hough, University of Illinois, Urbana, Ill., as editor of the Journal of Sedimentary Petrology.

The new S.E.P.M. officers will assume the responsibility of directing this 1,200-member organization at the close of the thirtieth annual meeting of the Society, which will be held in the Conrad Hilton Hotel, Chicago, Ill., April 23-26, 1956.

President-elect Shrock was born in Wampecong, Ind., August 27, 1904. After receiving his Ph.D. degree from Indiana University in 1928, he taught at the University of Wisconsin until 1937, advancing from assistant in geology to assistant professor of geology. He became assistant professor of geology at Massachusetts Institute of Technology in 1937 and has been a full professor at that institution since 1949. He has been chairman of the department since 1950. Prof. Shrock has published numerous articles on sedimentology and paleontology and his scientific affiliations, in addition to his S.E.P.M. membership, include the American Association of Petroleum Geologists, the Geological Society of America, and the Paleontological Society. Dr. Shrock is the present vice president of the S.E.P.M.

ARK-LA-TEX

NORTH LOUISIANA

Cotton Valley Discovery Completed at Homer

Kern-Trimble Drilling Co. and associates have completed a Cotton Valley oil discovery in southeastern Homer field, Claiborne Parish.

The 1 Oakes, C NW SW 29-21n-7w, flowed at the rate of 92 bbl. of 41°-gravity oil per day on ¼-in. choke from perforations in the Davis zone of the Cotton Valley at 5,109½-17. This new well is 4,300 ft. southeast of a Cotton Valley well completed in 1943.

West Lisbon Field Has Pettet Oil Discovery

the B-1 Killgore in 20-21n-5w, West Klein & Caruthers have completed Lisbon field, Claiborne Parish, as a Pettet oil discovery. The well flowed 430 bbl. of 32°-gravity oil per day on ¼-in. choke from perforations at 5,323-30½ ft.

This is the first good Pettet completion in the area. Two other wells have indicated Pettet production. The discovery well at West Lisbon is a Haynesville producer.

Mount Sinai Field Confirmed By Stanolind

Stanolind Oil & Gas Co. has confirmed the discovery well of Mount Sinai field in Claiborne Parish. The B-1 Bell Unit, SW¼ 4-22n-5w, is the east offset to the discovery well.

The new discovery flowed 401 bbl. of 44.3°-gravity oil per day on 48/64-in. choke. The well is producing from perforations at 10,314-36 and 10,350-56 ft. in the "A" zone of the Smackover. The "B" zone did not produce in this well as it did in the field discovery well.

EAST TEXAS

Second Smackover Well Completed at New Hope

New Hope field, located 9 miles south of Mount Vernon in Franklin County, gained its second Smackover well at Tide Water Associated Oil Co.

Write or Wire
for Monthly Stock Lists

● VALVES
● PRESSURE TUBING
● STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

Hydrocarbon
WELL LOGGING
DOMESTIC and FOREIGN
C — B
CARAN BROS.
ENGINEERING CO.
Milam Building
San Antonio, Texas
Branch Offices
HOUSTON and ALICE, TEXAS

and Seaboard Oil Co. 1-D Stocks Unit. Potential was 2,600 M.c.f. of gas, plus a high yield of 166 bbl. of condensate per 1,000 M.c.f. of gas. Production was from 12,498-12,513 ft.

The same firm opened the pool last year at 1 Ramey unit. Potential was 42,500 M.c.f. of gas, plus 148 bbl. of distillate per 1,000 M.c.f., from pay at 12,086-12,341 ft.

Red River County . . . Additional work has been announced for the new Southwest Bagwell pool. I & L Development Co. 3 Morris in John Guest Survey, is north of 2 Morris and a west offset to the discovery. No. 4 Morris is north of the field discovery.

Titus County . . . John B. Stephens and R. L. Peveto 1 Lewis, discovery prospect 4 miles northeast of Talco, were drilling ahead toward 6,500 ft. where casing will be run. The well reported logging 30 ft. of sand with oil shows in the basal Goodland and upper Paluxy.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Cochran County Devonian Strike Finaled for 342 BOPD

Jake L. Hamon and Texas Pacific Coal & Oil Co. 1-B Thompson, Devonian discovery in southwestern Cochran County, has been completed as a flowing discovery. Potential was 342 bbl. of 43.5° oil a day, based on an 18-hour flow test.

The new strike is 4 miles northwest of Fields-Devonian field. Operators swabbed in the well, from open hole at 11,889-11,902 ft., after which it flowed naturally at the rate of 14 bbl. an hour through 10/64-in. choke. Tubing pressure was 825 psi. with gas-oil ratio of 742:1. Top of the Devonian was 11,895 ft., or minus 7,972 ft.

Andrews County new pay . . . A new pay section, Strawn, has been added to the University Block 9 field, south of Andrews. Humble Oil & Refining Co. 1-AO State, in Section 10, flowed 508 bbl. of 34.7° oil a day through 24/64-in. choke, from perforations at 9,128-48 ft. Tubing pressure was 405 psi. and gas-oil ratio was 821:1. The well was drilled to 10,610 ft., then plugged back to 10,565 ft. Other pays in the field are the Wolfcamp, Pennsylvanian and Devonian.

Gas-Distillate Prospect In Winkler County

Richardson Oils, Inc. 1-B Stanolind-Hill and Mitchell, wildcat on the south flank of shallow production 8 miles southeast of Wink, has logged gas-distillate shows in the Fusselman. It previously made several flows of gas and distillate from the Devonian between 9,550-9,844 ft.

The lower tests were run at 10,166-10,230 ft., which recovered shows of oil and gas; at 10,100-10,165 ft. the well flowed gas and recovered distillate. Recovery on a 1-hour test from 10,230-80 ft. included 180 ft. of distillate and slightly gas-cut mud. Flowing pressure on the latter test was around 550 psi., and 45-minute shut-in pressure reached 4,400 psi. Further testing was scheduled.

GULF COAST

SOUTH LOUISIANA

Prolific Oil Reservoir Opened at Deer Island

An important oil reservoir appears to have been uncovered by Humble Oil & Refining Co. in its 1-W L.L.&E., deep wildcat test 2 miles southeast the Deer Island gas area, in western Terrebonne Parish.

At completion in its Miocene pay zone, perforated at 13,640-45 ft., it flowed at the rate of 504 bbl. of 35.4°-gravity oil per day through ½-in. choke with pressure of 7,000 psi. Flow was with 766,000 cu. ft. of gas. Hole had been drilled to 14,018 ft.

Allen Parish Wildcatter Finals Second Discovery

Sam J. Recile's new discovery well 3 miles northeast of Reeves field, in southwestern Allen Parish, produced at the rate of 15 bbl. of 38.9°-gravity oil and 2,108,745 cu. ft. of gas per day during its completion gage. Flow was through 5/32-in. choke under pressure of 3,500 psi. Its pay is perforated at 6,358-62 ft. Total depth is 8,211 ft. The new well is the operator's 1-A Gray, in 22-6s-6w.

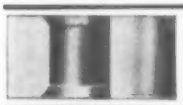
In the meantime, this operator's 1 Powell, less than 1 mile northwest, in Section 21, has failed to find commercial production after drilling to 10,190 ft., and has been abandoned.

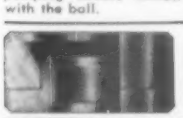
His new discovery is his second in Allen Parish within less than 2 months. Late last November, he completed a gas-condensate discovery well southwest of the new Harmony field, 5 miles northeast. He has two other deep wildcat tests drilling in the parish, one 4 miles south of the Gray discovery, and the other about the same distance northeast, and about 2½ miles south of his Harmony discovery.

TEXAS GULF COAST

Frio Oil-Discovery Well Finalled in Fannin Area

New Frio oil discovery has been made in the old Fannin area, in southeastern Goliad County. It is in a well completed by A. B. Alkek with a flow rate of 69 bbl. of 26.5°-gravity oil per day through 9/64-in. choke. Flow was


"Single Seal" Seat
A competitively priced stainless steel seat for routine pumping.
"Double Seal" Seat
For harder than usual pumping—double contact with the ball.


"O-Ring" Seat
A 2-piece stainless steel seat specially recommended where ordinary or fracturing sand is causing seat failures.
"Sheralloy" Seat
A cast alloy definitely proved resistant to corrosion. Also good for hard pumping.

COMBINED RIGHT TO WEAR LONGER
Ball and Seat Assemblies by
Baird
Manufacturing Co.
P. O. BOX 380
TULSA, OKLA.
AT YOUR FAVORITE SUPPLY STORE
"Sheralloy" Ball
Excellent to combat corrosion and hard enough for deep pumping. Non-magnetic.

"Ceramic" Ball
Nearly as hard as a diamond. Non-corrosive and non-magnetic.
"Stainless Steel Ball"
For ordinary pumping where little trouble is encountered.

under pressure of 200 psi. with gas-oil ratio of 210 cu. ft. per barrel.

The well, 1 Swickheimer et al, in the Juan Rener Survey, is about 1½ miles southeast of Fannin townsite. It was drilled to 4,756 ft. and is producing from perforated interval at 3,657-60 ft. Permit for the well was in the name of McKenzie Drilling Co.

New Oil Area Opened by Karnes County Discovery

A new oil-productive area is being opened in southeastern Karnes County, near the DeWitt County line.

Discovery is by Dunlap Oil Corp., of San Antonio, at its 1 Wolters, in the line of the R. Stitz Survey and V. Blanco Grant. Location is 8 miles southeast of Runge, and 2 miles southwest of Nordheim field.

The discovery well was drilled to 4,050 ft., and is productive from perforated interval at 3,973½-77½ ft. Tested through 5/64-in. choke, it flowed 44.32 bbl. of 46.1°-gravity oil per day. Gas-oil ratio was 1,750 cu. ft. per barrel, and flowing pressure 1,050 psi. No water was indicated.

Drilling is under way at the operator's first confirmation test, 2 Wolters, a location northeast.

New San Patricio Area Produces Gas-Condensate

Conroe Drilling Co. and Stanolind Oil & Gas Co. have a new gas-condensate discovery well 5 miles northwest of Aransas Pass, in southeastern San Patricio County. It is their 2 Bankers Mortgage, rated good for 19,000,000 cu. ft. of gas per day, openflow, from 10 ft. of sand, perforated at 8,454-64 ft. Liquid recovery, is 70 bbl. per 1,000,000 cu. ft. of gas. Shut-in pressure of the well is 3,900 psi. Gravity of the liquid is 60.9°.

Live Oak County Gets New Pettus Sand Area

Discovery of another Pettus-sand oil-productive area, located 3½ miles southeast of Anna Rose, in southern Live Oak County, has been made by W. G. Darsey, Jr., and Pyramid Drilling Co., joint operators. Their discovery well, 1 Reynolds, in the G. W. Sharp Survey, produced at the rate of 69.19 bbl. of 24.5°-gravity oil (net) per day through ⅝-in. choke with pressure of 510 psi., and gas-oil ratio of 1,968 cu. ft. per barrel. Total fluid recovery cuts about 15 per cent water. Pay, in hole drilled to 4,930 ft., is perforated at 4,860-66 ft.

WESTERN CANADA

ALBERTA

Wet Gas Found at Whitecourt Wildcat

Phillips Petroleum Co. has discovered wet gas at its Whitecourt area wildcat on LSD 10, 22-58-11w5, 9 miles southeast of the town of Whitecourt and 84 miles northwest of Edmonton.

The 1 Whitecourt well, tested gas at the estimated rate of between 4 and 5 million cubic feet per day with no water recovery on drill-stem test of the basal Blairmore sand.

This new discovery is 24 miles east-southeast of the Canadian Fina-Stanolind-Hudson's Bay 12-36 Windfall wet gas discovery, a D3 Devonian strike. The new well is preparing to test at the 5,539-ft. mark.

Compeer Area Mississippian Oil Discovery Completed

Texaco Exploration Co. completed the Mississippian oil discovery well for 96 bbl. per day on pump at Compeer, 2 miles southwest of the Alberta-Saskatchewan border.

The A-1-22 Compeer, LSD 1, 22-33-1w4, is 60 miles southeast of Coronation and 115 miles southeast of Stettler. Texaco will drill a confirmation well 1¾ miles northeast of the new oil discovery.

The Compeer discovery was first announced last summer.

Viking Oil Pay Reported At Second Burbank Well

The Baysel - Crowsnest - Conic team reported as estimated 24 ft. of Viking sand oil pay at the second Burbank field well in Central Alberta.

The 1-14 well, LSD 1, 14-39-27w4, is ¼ mile east of the discovery. The discovery well made about 1,200 bbl. per day on drill-stem tests.

Wilson Discovery Well Recovers Rundle Oil

The confirmation test to the Wilson area discovery in southern Alberta recovered 210 ft. of clean oil on a drill-stem test last week. The well is Mobil Oil of Canada's 5-4 Wilson-CPR, LSD 4, 5-8-20w4, ½ mile north of the discovery well.

The discovery confirmer topped the Rundle pay at 13 ft. lower than the discovery well. Further testing is under way in order to determine the commercial worth of the confirmation try. The contractor is drilling 103 ft. below the Rundle contact point, 46 ft. below last reported drill-stem test.

The 5-4 Wilson well hit the Rundle at 3,950 ft. The first drill-stem test was run at 3,949-62 ft. Gas flowed to the surface at the end of the 1½-hour test. Pipe recovery was 210 ft. oil and 40 ft. heavily oil and gas-cut mud.

The 32-12 Wilson discovery well topped the Rundle at 3,945 ft. Production tests were made at 3,952-60 ft. Initial production after swabbing and acid was 148 bbl. per day on 20/64-in. choke.

BRITISH COLUMBIA

Follow-Up Well to Boundary Lake Reported

Texaco Exploration Co. reported success at the first confirmation try to the Boundary Lake I Triassic oil discovery in northeastern B. C.

The A-14-6 well, LSD 14, 6-86-13w6, is ½ mile north of the discovery well. Production was indicated on drill-stem tests. Recovery of 4,000 ft. of clean oil is reported.

The Boundary Lake area is 2 miles west of the Alberta-B. C. border, 45 miles northeast of Dawson Creek and 105 miles west of Peace River town.

Tehetlaandoa Test to Seek Oil in Remote Area

Texaco-N.F.A. 1 Tehetlaandoa, 59 degrees, 22 minutes North Latitude, and 121 degrees, 14 minutes West Longitude, is a remote B.C. test that will seek oil in a area far removed from production.

The well, 55 miles northeast of Fort Nelson, spudded on December 30. The crew is below 214 ft. Location is 46 miles south of the N.W.T. border and 43 miles west of the Alberta-B.C. border.

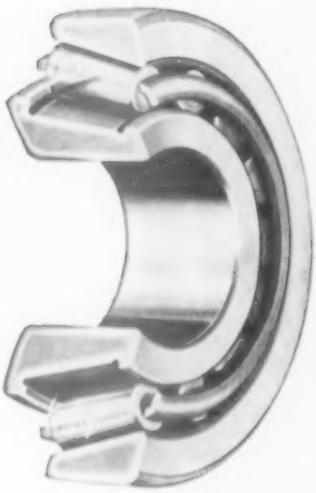
SASKATCHEWAN

Imperial Oil, Ltd., has flowed oil at another wildcat venture in the southeastern sector of Saskatchewan, which in recent months has proved to be the most encouraging wildcat area in Western Canada. This new strike is situated 5½ miles south of Cantal town and 4 miles southwest of Cantal townsite.

The well, Imperial 12-1 Cantal, on LSD 12, 1-5-34w1, was drilled to a total depth of 4,348 ft. and a drill-stem test in the Mission zone of the Mississippian formation was conducted. During that 40-minute test of the interval 3,755 to 3,780 ft., natural gas flowed to the surface at a rate of 360,000 cu. ft. daily. Oil was recorded at the surface in 20 minutes and when pipe was pulled it was found to con-

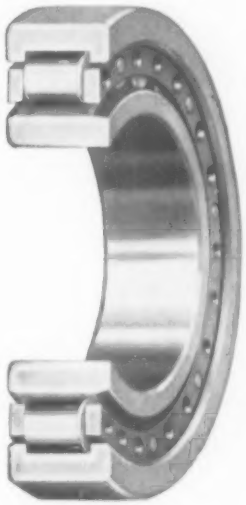
WHATEVER YOUR ROLLER BEARING APPLICATION

specify BOWER!



Earthmovers, jet turbine engines, rolling mill equipment, truck axles—you name it! Bower builds a complete line of tapered, straight and journal roller bearings including a size and type to fit *your* product. What's more, these dependable bearings have *proved* themselves in virtually every conceivable type of application. Their built-in quality, skillful engineering and advanced design features provide such important bearing advantages as reduced wear, longer life and lower maintenance requirements. Let a Bower engineer give you full details on the complete Bower line.

BOWER ROLLER BEARING DIVISION
Federal Mogul Bower Bearings, Inc., Detroit 14, Mich.



BOWER TAPERED ROLLER BEARINGS INCORPORATE ADVANCED SPHER-O-HONED DESIGN! Spherically generated roll heads and higher flange with larger, two-zone contact area reduce wear, improve roller alignment and virtually eliminate "end play." This helps hold adjustment and pre-load longer and better. Larger oil groove provides positive lubrication.

BOWER STRAIGHT ROLLER BEARINGS ARE BUILT TO CARRY MAXIMUM LOADS! Integral two-lip race increases rigidity—keeps rollers in proper alignment at all times. Steel cage allows free movement of rollers between races during normal operation. High-grade alloy-steel rollers and races are precision-ground for quieter, smoother operation.

A COMPLETE LINE OF TAPERED, STRAIGHT AND JOURNAL ROLLER BEARINGS
for every field of transportation and industry

AUTOMOTIVE

RAILROAD

FARM

AIRCRAFT

EARTHMOVING

INDUSTRIAL

BOWER
ROLLER BEARINGS

SPHER-O-HONED

tain 300 ft. of muddy, frothy oil. Gravity was measured at 42°.

A second test immediately below the discovery drill-stem interval, had a pipe recovery of 300 ft. of muddy salt water.

Completion procedure is currently being carried out on this venture.

ROCKY MOUNTAIN

MONTANA

Carter Tests Apparent Yellowstone Discovery

Carter Oil Co. recovered 3,600 ft. of oil on 4-hour drill-stem test at 6,198-6,209 ft. at 1 Horton, C SE SE 29-7n-32e, 2 miles south of the Wolf Springs discovery, Yellowstone County. Tool was open 4 hours, and flowing pressure reached 1,015 psi. Carter recovered 5 ft. of fractured dolomite with good saturation in the lower portion of a core 6,201-09 ft. The upper 3 ft. of the 8-ft. core had some shows.

The operator is coring below 6,209 ft.

Wolf Springs Confirmation Near Completion

Atlantic Refining Co. is running pipe at total depth of 6,231 ft. at 2 Horton Estate, C SE NW 18-7n-32e, confirmation to the Wolf Springs discovery in Yellowstone County. The well flowed at the rate of 45 bbl. of oil per hour on drill-stem test at 6,088-6,116 ft. in Amsden dolomite. The confirmation is ½ mile north of the discovery.

South Grieve Area Wildcat Testing

True Oil Co. and R. H. Fulton are running drill-stem test of shows believed to be in Dakota at 1 Ritter, C SE SE 32-32n-84w, in the South Grieve area of Natrona County. The operators had oil stain in a 6½-ft. core recovery at 6,399-6,415 ft.

Small shows were previously logged in Muddy, but drill-stem test recovered only oil-cut mud.

The well is 4 miles southeast of Grieve field, which produces from the Muddy zone of Thermopolis shale.

Saturation Cored at Hot Springs County Wildcat

Mule Creek Oil Co. has recovered more than 100 ft. of saturation in cores of Phosphoria at 1 Govt.-Neel, C NE NW 33-44n-100w, Hot Springs County. The operator ran tests in this formation at 4,305-47, 4,372-84 and 4,372-4,438 ft. but recovered only drilling mud.

The well is 11 miles southwest of production at Wagonhound field, and will test to Madison at about 6,000 ft.

NORTH DAKOTA

Burke County Discovery Indicated

Texota Oil Co. has recovered free oil on test of Mission Canyon in a Burke County wildcat 27 miles north of production in Tioga field, and about the same distance southwest of production in the Canadian portion of the Williston basin.

Test at 6,206-41 ft. at 1 Swenson, NE SW 22-163n-93w, recovered 810 ft. of very heavily oil and gas-cut mud, estimated 50 per cent oil, 310 ft. of 32°-gravity green oil and 30 ft. of salt water. Tool was open 4 hours, and there was a flow of gas at the estimated rate of a half million cubic feet per day after 45 minutes. Flowing pressure was 400 psi. at the end of the test.

An earlier test at 6,166-82 ft. recovered 500 ft. of oil and gassy mud emulsion and 230 ft. of salt water. Texota also tested at 6,244-74 ft. and recovered 10 ft. of gas-cut mud, 900 ft. of gas-cut mud with a trace of oil, and 180 ft. of sulfur water.

The operator is drilling below 6,402 ft., still in Mission Canyon. Top of the Mission Canyon zone which produces at Tioga was found at 6,190 ft.

The well is the second in the area by Texota. The first was completed in 1955 after test of non-commercial shows. The area is one which has been sparsely drilled, but which has attracted increasing attention in recent months.

Divide County Wildcat Testing

Phillips Petroleum Co. and R. M. Ballard recovered 86 per cent water on swab tests of 1 Braathen, NE NW 29-162n-95w, Divide County. Test is in Mission Canyon at about 7,089-92 ft. and testing is coninuing.

UTAH

Operator Running Pipe at San Juan County Wildcat

The Texas Co. is running casing at 1 Navajo, C NW NE 23-40s-24e, in San Juan County. The well is 12 miles northeast of production from Pennsylvanian in Desert Creek field. Total depth is 4,745 ft., with top of Hermosa called at 4,735 ft. No details of tests or cores have been reported by the operator. The wildcat was originally scheduled to test Devonian at about 7,200 ft.

NEBRASKA

Morrill County Discovery Being Completed

Ohio Oil Co. is installing pump at 1 Lane, C NW SE 17-17n-49w, Morrill County. The operator swabbed 241 bbl. of oil in 25 hours from perforations at 4,596-4,600 ft. Test is in J sand. The well is 1 mile north of Dalton field, Cheyenne County, and 7 miles south of Hart field, one of two existing fields in the county.

Ohio previously reported recovery of 20 ft. of oil on 2-hour test in J sand at 4,598-4,604 ft.

Petroleum Review, Yokum And Terry Counties Published

Phifer Petroleum Publications, Box 20,024, Houston, Tex., has issued another in their series of $10 books on oil-producing West Texas counties.

The book on Yoakum and Terry counties covers the complete oil history of each county. Data included are a chronology of field discoveries, with year and date; production record by fields, with number of wells and cumulative production.

The piece is well illustrated with county maps showing fields, a geological chart for West Texas, field contour maps, and discovery-well logs.

SOUTHEASTERN STATES

ALABAMBA

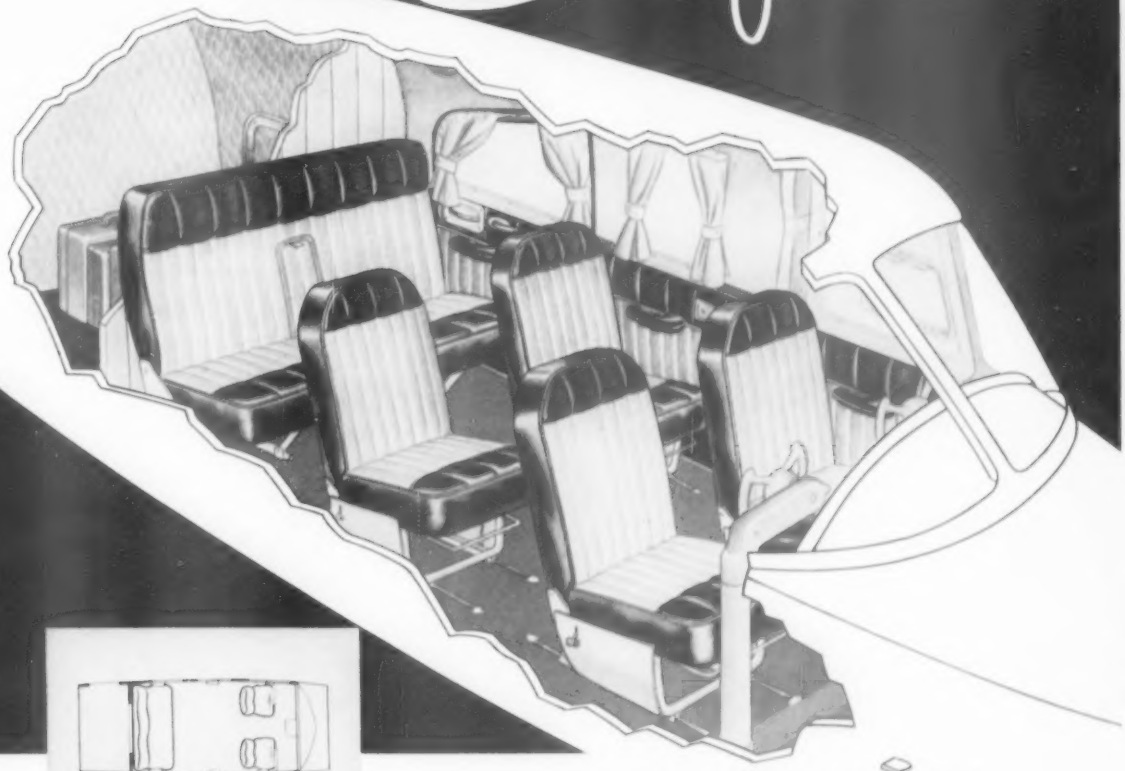
Second Oil Well Finaled at Citronelle

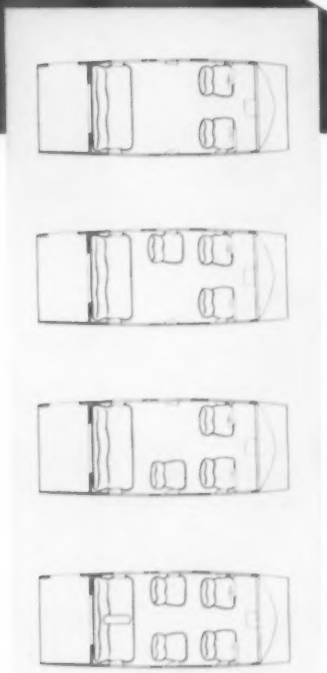
The west offset and second oil well in new Citronelle field, Mobile County Lower Cretaceous discovery, has been completed.

Zach Brooks Drilling Co. et al 1 Smithers, 26-2n-3w, ¼ mile west of the important Citronelle discovery well, flowed 490 bbl. of 45.3°-gravity oil per day on ¾-in. choke from perforations in the Rodessa at 10,880-10,936 ft. Tubing pressure was 675 psi.

The discovery well of Citronelle, which was one of the most significant strikes of 1956 for the Southeastern region, in fact, the entire country, flowed oil at the rate of 342 bbl. of oil per day on ¼-in. tubing choke from perforations in the Rodessa at 10,870-90, 10,912-22, and 10,950-59 ft. From the deeper Sligo zone the discovery well flowed at the rate of 53 bbl. of

room to be Comfortable





The spacious unobstructed floor lends itself to a multitude of customized cabin arrangements.

. . . in both great COMMANDERS

INDIVIDUAL BY-THE-WINDOW SEATS
ADJUSTABLE RECLINING CHAIRS
CONVENIENT CENTER AISLE
MOVE-ABOUT FREEDOM IN FLIGHT

The long, roomy 10¾-foot COMMANDER cabins are designed to give the executive maximum comfort and utility in his executive airplanes.

AERO Commander

560-A · 680-SUPER

WRITE FOR CATALOG 120-A WRITE FOR CATALOG 120-S

AERO DESIGN & ENGINEERING CO • TULAKES AIRPORT • P. O. BOX 118 • BETHANY, OKLAHOMA

He didn't know about

Nothing but the finest will bear the name of

SLUSH PUMP VALVES ◎ VALVE SPRINGS ◎ VALVE SEAT PULLERS ◎ PISTONS ◎ PISTON RODS

Just as an expertly honed razor, with a perfectly smooth surface shaves cleanly without doing any damage — the precisely honed bores of ***Mission Super-Service* Liners*** with ultra smooth ***Satin Finish**** let pistons operate smoothly and offer no uneven or jagged surfaces that start wear and cause failure in liners and piston rubbers. That's why ***Mission Super-Service* Liners*** with ***Satin Finish**** cut down time and give performance far superior to ordinary liners.

Available through all supply stores, everywhere.

*Trade Mark Registered U. S. Patent Office.

Satin Finish*

MISSION MANUFACTURING CO.

P. O. BOX 4209 • HOUSTON, TEXAS • EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK

LINERS • GLAND PACKINGS • SLIPS • SWABS • CENTRIFUGAL PUMPS • PLUG VALVES

Bank of the Southwest

NATIONAL ASSOCIATION, HOUSTON.

will be the new name of Second National Bank on January 17, 1956

THE STORY BEHIND OUR NEW NAME

For the second time in almost 50 years of existence, the name of Second National Bank of Houston will be changed. The new name will be "Bank of the Southwest National Association, Houston, Texas." This new name is an important and necessary milestone in the growth of Second National Bank. It has been concluded that the present name does not reflect the scope of the bank's activities, but that "Bank of the Southwest" indicates more descriptively the area of the bank's primary operations.

The new name becomes official January 17, 1956, at the annual meeting of the bank stockholders.

FOUNDED IN 1907

Founded April 15, 1907, as the Lumberman's National Bank, the institution's name was changed in January, 1923, to the Second National Bank of Houston. In 1907, the choice of "Lumberman's National Bank" was a logical one because Houston's initial growth was the result of East Texas lumber industry.

By 1923 the timber of East Texas had been depleted greatly, and the major lumber companies had turned their saws to the extensive forests of the Pacific Northwest. By that time, too, the Port of Houston had expanded to change materially Houston's vibrant economy.

HOUSTON'S OLDEST BANK

In 1923, the bank's descriptive name was dropped, and the more suitable "Second National Bank of Houston" was adopted in keeping with the times. The numerical "Second" in the name alluded to the bank's holding the second oldest national charter in the city at that time. Its charter now is the oldest. The change of name was followed in 1923 by the bank's moving to new quarters at its present location, Main at Rusk. The 1956 change of name will be followed shortly by the bank's moving into the new bank building—Houston's largest skyscraper.

Today, with total resources exceeding 300 million dollars, the board members decided that the present name fails to describe fully the numerous activities of the bank. Also, its numerical designation has become erroneous since the bank now holds the oldest national charter in Houston. Today, bank depositors of Second National are found in almost every western state, many southern states, and a great number of foreign countries in Europe, Asia, Latin America, and the Far East.

The new name, "Bank of the Southwest," is more in keeping with Houston's prominence in this area of our nation. Bank of the Southwest will continue to operate under its original national bank charter, granted April 15, 1907.

The New Bank of the Southwest Building Now 85% Complete

Col. W. B. Bates, Chairman of the Board:

"Bank of the Southwest is more than just a new name for Second National Bank. It is the basic idea behind our bank's new expansion plans. It is also a symbol of the growth of our bank into a larger, more useful banking organization — serving you and the entire Southwest."

L. R. Bryan, Jr., President:

"Bank of the Southwest symbolizes a new concept of dynamic banking service. Our bank's area of activity has increased so extensively during the past recent years that the name change is a natural, inevitable step in our progress. We hope that to you, the customer, this new name will quickly take on a familiar ring."

A. G. McNeese, Jr., Assistant President:

"We know you'll like our new name. Over 120 names were considered before Bank of the Southwest was chosen. We want our new name to have this meaning for you . . . warm friendliness . . . a genuine personal interest in your financial affairs . . . specialized banking service for your convenience."

SECOND NATIONAL Bank of Houston

MAIN AT RUSK — RESOURCES OVER 300 MILLION DOLLARS

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

oil per day on ½-in. tubing choke from perforations at 11,051-53 ft.

MISSISSIPPI

Wilcox Discovery Finaled In Adams County Area

John S. Callon has a new Wilcox discovery at 1 George-Foules Unit in 24-5n-2w. Pump is being set up for completion.

This Wilcox strike flowed 51 bbl. of oil in 12 hours on 13/64-in. choke from perforations at 6,513-15 ft. The state nomenclature officials have named the new producing area "South Kingston field." The well is about 1 mile south of Kingston field.

Successful Wildcats

ALBERTA

Canadian Export Gas 6-19 East Helmsdale, LSD 6, 19-26-6w4. TD 3,305 ft. Sunburst gaswell.

Home et al 3-17 Harmatton, LSD 3, 17-33-4w5. TD 8,900 ft. Mississippian oilwell.

NORTH LOUISIANA

Claiborne Parish: Kern-Trimble Drilling Co. 1 Oakes, C NW SW 29-21n-7w. IPF at rate of 92 BOPD, ⅛-in. choke, 41°, Davis zone-Cotton Valley 5,109-17 ft. TD 5,518 ft. (Cotton Valley discovery in Homer field.)

Klein & Caruthers B-1 W. E. and A. G. Killgore, 20-21n-5w. IPF at rate of 430 BOPD, on 4-hour test, ¾-in. choke, 32°, Pettet 5,323-30½ ft. TD 5,380 ft. (Pettet discovery in West Lisbon field.)

MICHIGAN

Lapeer County: John W. Johnson 1 Clemons, SE NW SE 16-9n-9e. IP 10 BOD, Berea sand 1,449 ft., TD 1,467 ft. (New pool.)

SOUTHEAST NEW MEXICO

Lea County: Atlantic Refining Co. 1 Daisy Chambers, 26-15s-35e. IP 222 BOPD, ¾-in., TP 500 psi., GOR 1204, 44°, Pennsylvanian 10,581-10,606 ft. TD 14,015 ft. Elev., 3,975 ft., Devonian 13,965 ft.

WEST TEXAS

Ector County: Texas Crude Oil Co.1-8 Wight, 8-43-T1S-T&P, 5 miles SE Goldsmith. IP 2,878 BOPD, ¾-in., TP 360 psi., GOR 810, 33.8°, Grayburg 4,075-4,150 ft. TD 9,131 ft.

Runnels County: Hoxsey Oil Co. 1 Vancil, Sec. 526, J. J. Eakin Sur., 1 mile west Hatchell. IP 137 BOPD, 16/64-in., TP 165 psi., GOR 360, 43°, Palo Pinto 3,470-74, 3,849-95 ft. TD 4,375 ft.

NORTH TEXAS

Cooke County: J. C. Karcher 1 University 44,581, University Lge. 8, 3½ miles south-southwest Walnut Bend. IP 135 BOPD, GOR 126, 35.5°, pay 4,574 ft. TD 5,671 ft. Choke and pressures not reported.

Kay Kimbell 1 Westbrook, Elizabeth Barnes Sur., A-43, 4 miles southeast Callisburg. IP 34 BOPD, GOR 100, pay 3,447 ft. TD 3,453 ft.

Wise County: Advance Exploration Co. and Western States Oil Co. 1 McKeever, Lot 6, Blk. 4, Cooke CSL, 3 miles northeast Chico. IP 1,000 M.c.f. gas, pay 5,370-80 ft., shut-in pressure 1,203 psi. TD 5,937 ft., elev. 934 ft.

Young County: O. P. Leonard 1-A McKinley, J. R. Crouch Sur., A-1298, 2½ miles southeast Graham. IP 122 BOPD, ¼-in., TP 500 psi., GOR 900, 42°, pay 4,034-39 ft. TD 4,393 ft.

Lisle & Buckalew 1 Gragg, A. Rohus Sur., A-240, 5 miles northeast Jean. IP 155 BO in 12 hours, 39°, CP 700 psi., GOR 500, Strawn 3,339-56 ft. TD 3,356 ft. OWPB, old TD 5,374 ft.

Rankin & Karper 1 Finch-Kesterson, TE&L Sur. 40, A-316, 4 miles northwest Newcastle. IP 20 BOPD, 40°, GOR 250, pay 3,502 ft. TD 4,922 ft.

Warren Petroleum Corp. 1 King, TE&L Sur. 2937, A-1207, 3 miles southwest Newcastle. IP 235 BOPD, 18/64-in., TP 240-120 psi., GOR 443, 40.7°, Strawn 3,421-32 ft. TD 4,800 ft., elev. 1,209 ft. Suggested field name, Warren King-Strawn.

WEST CENTRAL TEXAS

Stonewall County: F. Kirk Johnson 1 Rutherford, 145-1-H&TC, 8 miles south Aspermont, 1 mile south Frankirk field. IPP 51 BOPD, 34.7°, GOR 300, Canyon lime 5,205-10 ft. TD 6,155 ft.

EAST TEXAS

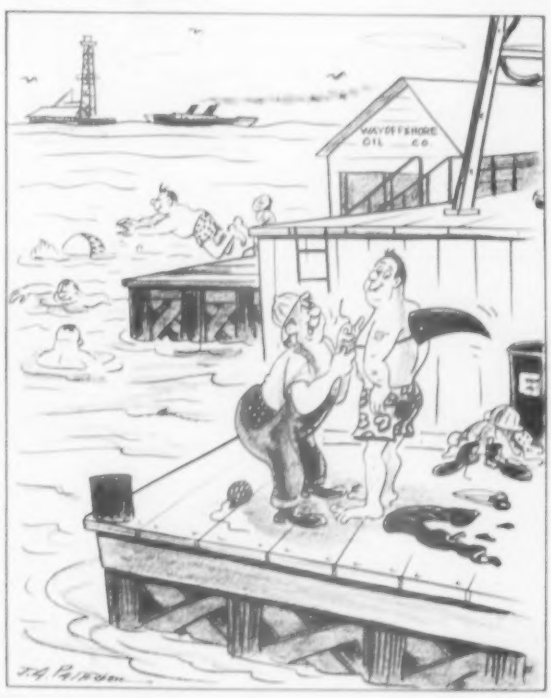
Limestone County: Humble Oil & Refining Co. 1-B Joe Ross heirs, Pedro Varela Sur. 2621, 4 miles southwest Mexia. IP 7,500 M.c.f. gas, plus 60 bbl. 65.7° distillate per 1,000 M.c.f., shut-in pressure 3,053 psi., GLR 16,500:1, Smackover perforations 8,536-49 ft. TD 8,645 ft.

DIAMONDS ARE AN OIL MAN'S BEST FRIEND!

D & S TRUCO DIAMOND BITS make hole faster and save a tremendous amount of time and money. Ask us to have a D & S salesman-engineer advise regarding your particular diamond equipment needs.

Drilling & Service

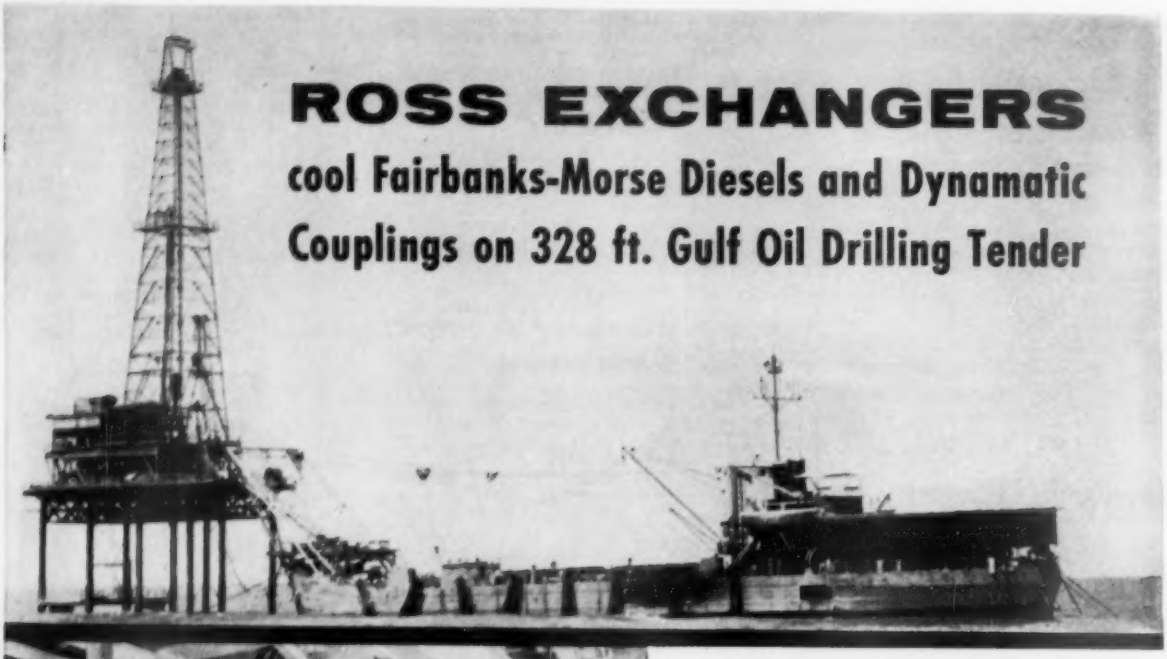
ULTRA FINE DIAMOND EQUIPMENT FOR THE OIL FIELD
DALLAS, TEXAS | OFFICES IN PRINCIPAL OIL AREAS

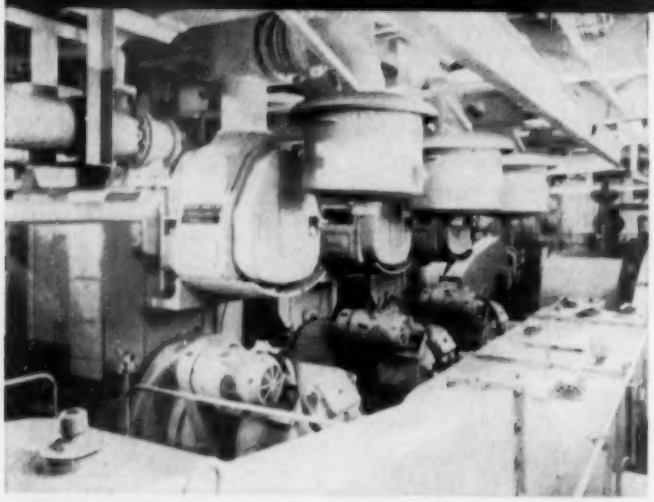


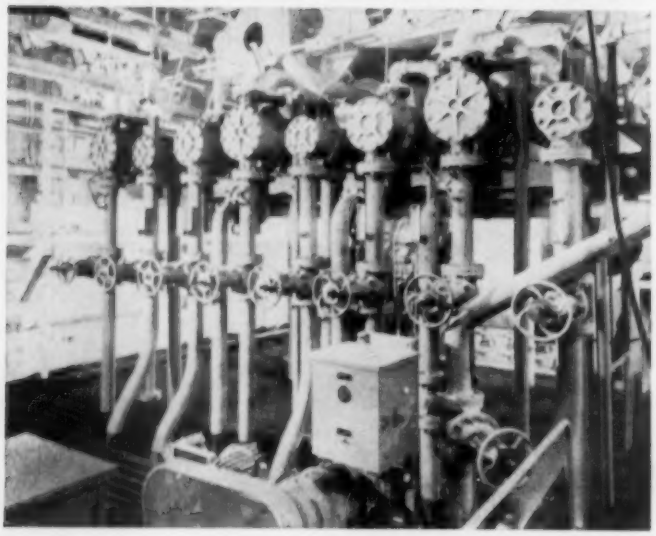
"Now, you're sure you can swim under water that far?"

ROSS EXCHANGERS

cool Fairbanks-Morse Diesels and Dynamatic Couplings on 328 ft. Gulf Oil Drilling Tender







Aboard Gulf Oil Corporation's 328 ft. drilling tender "Eagle," three Fairbanks-Morse dual-fuel opposed-piston Diesels power a specially-engineered mud pump unit.

To keep these engines humming smoothly, Ross Exchangers cool both lube oil and jacket water. Safe operating temperatures are assured at all times!

Transmitting rotation from the engines to the transmission shafts, Dynamatic electric couplings are protected in the same way. Coupling cooling water systems also feature rugged, dependable Ross Exchangers.

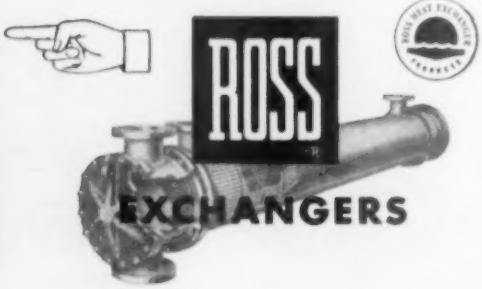
Throughout the oil and gas industries, you'll find Ross Exchangers at work, not only serving engines and other primary equipment, but also the more specialized distillation units themselves — wherever there is a heating, cooling or condensing requirement.

Pre-engineered and fully standardized, Ross Exchangers are promptly available in a wide range of designs and sizes to meet your requirements. *They're unrivaled for thermal efficiency and ruggedness!*

For detailed information, request Bulletins 1.1K5 and 2.1K5.

ROSS HEAT EXCHANGER DIVISION
of
American - Standard

1413 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.



PERSONALS

I.P.A.A.'s new president is . . .

. . . A Dedicated Independent

THE Independent Petroleum Association of America has a new president this month who fits its membership like a glove.

He is Robert L. Wood, personable 44-year-old owner of Basin Drilling Co., Midland, Tex., and a successful independent oil producer. But Wood didn't become an independent by accident—it was by design.

Wood left a successful career with General Motors Corp. in Dallas to enter an entirely new field of work simply because he "wanted his own company." This desire for independence—for an industry with attractive opportunities for newcomers—was based on the same philosophy which prompted founding of the I.P.A.A.

Wood still believes the oil industry will stay attractive to present-day newcomers just as long as it remains independent of government controls. He is pledged to devote his energies to relieving the natural-gas producers from federal controls, to the fight to limit foreign imports, and to maintaining the depletion allowance.

He takes office in a time of decision for all these issues before Congress. The Senate is expected to act this month on the Harris Bill. Course of action for the others is less certain.

Hard beginning . . . Wood has lived all his life in the oil country.

He is a native of Dallas, was educated in its public schools and at Austin College, Sherman, Tex. After graduation in 1931, he started working for Chevrolet Division of General Motors unloading freight cars 13 hours a day.

He was successively promoted from that to the stockroom, to sales promotion and then to the General Exchange Insurance Co., which handled G. M. credit insurance.

Wood resigned from G. M. in 1939 and joined H. E. Childs, Jr., in organizing the Western Co., headquartering at Seagraves, Tex. Together they offered acidizing service to the then mushrooming Permian basin oil region.

Wood sold his share of the Western Co. in 1946. The next year he organized Frontier Chemical Co. to manufacture hydrochloric acid and caustic soda. He served as president of the organization until 1950.

In 1949 Wood also helped form Basin Drilling Corp. and in 1951 become sole owner. It now operates two rotary drilling rigs in the Permian basin and North Texas areas, and has comfortable oil production from several leases.

Wide interests . . . Wood shares his energies with a variety of civic, church, and industry activities.

He is an officer and director of two banking institutions at Midland, a director of Central Airlines, trustee of Austin College, and a deacon in Midland's First Presbyterian Church. He also is active in chamber of commerce, community chest, and city government at Midland.

Wood also is active in several oil groups besides the I.P.A.A.

He is married to the former Mae Hooks Files of Itasca, Tex. The couple has two sons and two grandsons.

John A. Norwood has been moved up by Gulf Oil Corp. from staff geologist at Fort Worth to assistant zone geologist at Midland, Tex.

Don Anderson, Calgary production superintendent for Canada-Cities Service Petroleum Corp. for 4 years, has been made local operations manager, and will supervise all the company's operations. Anderson takes over exploration management from **Z. E. Stucky,** who has been moved to another Cities Service operation.

H. O. Cameron, assistant secretary and assistant to the manufacturing and production vice presidents of Sun Oil Co., has retired after 51 years' service. Cameron is a former manager of Sun's Toledo and Yale, Okla., refineries.

W. T. Thagard III has been named to the new post of directors of plans and economic research for Texas Eastern Transmission Corp., Shreveport. Thagard joined Texas Eastern in 1947 as administrative engineer.

Dr. T. S. Leary has joined Cities Service Research & Development Co. as manager of the process development laboratory in Lake Charles, La.

Dr. S. M. Foulks has been promoted to senior research mathematician at Magnolia Petroleum Co.'s field-research laboratory, Dallas. Foulks will continue working on applications of mathematics to production flow problems.

E. W. Masters, executive assistant to Shell Oil Co.'s Pacific Coast area vice president, has retired after 40 years in the industry, 30 of them with Shell. Masters joined the firm as a production engineer.

John H. Buckley has been named assistant Mid-Continent division superintendent for Sohio Petroleum Co.

Walter C. Roberts, manager of Shell Oil Co.'s West Coast pipeline operations since 1946, has retired after 40 years of pipelining.

H. G. McCarver has been promoted by Seaboard Oil Co. from Mid-Continent division geological and geophysical manager to assistant vice president and general manager.

Dr. Sylvain J. Pirson, special research associate at Stanolind Oil & Gas Co.'s Tulsa research center, will resign February 1 to join the University of Texas faculty. He will teach petroleum engineering. Pirson was a Pennsylvania State University professor before joining Stanolind 7 years ago.

J. P. Yadon has resigned as operations superintendent with Peppers Refining Co., Oklahoma City, to join Oriental Refining Co., Denver, as assistant superintendent.

PERSONALS

Oklahoma Independents Reelect Officers

Roy G. Woods, Oklahoma City, right, was reelected president of Oklahoma Independent Petroleum Association at the group's first annual convention in Tulsa last week. Ward S. Merrick, Ardmore, vice president, left, and Robert A. Hefner, Jr., Oklahoma City, secretary, also were reelected.

J. C. Thompson has resigned as geologist for Seaboard Oil Co. at Billings, Mont., to become a consultant there.

Duncan Kimmel has resigned as petroleum engineer for Midstates Oil Corp. in Tulsa to join Tennessee Gas Transmission Co. in Oklahoma City.

W. L. (Bill) Mallams has been promoted by Cities Service Gas Co. from north Hugoton station foreman to superintendent of compressor stations at Atchison, Craig, and Tonquanoxie, Kans.

Jerry V. George has resigned as petroleum engineer for Magnolia Petroleum Co. at Salem, Ill., to join Texas-Canadian Oil Corp. at Paintsville, Ky.

J. Frank Skidmore, former assistant to the operations manager, Equitable Gas Co., Pittsburgh, has been promoted to manager of planning and development for Kentucky-West Virginia Gas Co. at Ashland, Ky.

John H. Van de Venter, former joint accounts manager for Western Natural Gas Co., Houston, has been transferred to Calgary as division manager for Gulf States Oil Co. of Canada. Both firms are El Paso Natural Gas Co. subsidiaries.

C. E. (Gene) Davis, former Shell Oil Co. refining vice president and associate deputy petroleum administrator for defense, has become a Kirkwood, Mo., consultant.

L. E. Hanna has been named assistant chief engineer for Panhandle Eastern Pipe Line Co. Other Panhandle appointments: **D. P. Heigele,** to be construction superintendent; **H. S. Kraybill,** to supervise design; and **C. H. Kent,** supervisor of estimating and accounting.

MANGELSDORF

Harold Mangelsdorf, general manager of manufacturing and a director of Esso Standard Oil Co. since 1953, has been named to the board of directors' executive committee. **J. Prince Warner,** former general superintendent for Esso at Baltimore, succeeds Mangelsdorf. The new committeeman joined the Standard organization in 1934 as an engineer at the Baton Rouge refinery. After serving as assistant manager there, he was moved up to the Bayway, N. J., plant as general superintendent. Two years later, he became East Coast manager.

O. L. (Bill) Martin, long-time Michigan and Illinois production engineer, has been named production manager and coordinator for Turner Petroleum Corp. and Michigan Oil Co.

Frederick C. King, assistant to the manager of General Petroleum Corp.'s Torrance, Calif., refinery since July, has been named assistant manager.

Samuel B. Frazier, formerly zone geologist for Gulf Oil Corp.'s Kansas-Eastern zone, has been named to manage the firm's newly created Appalachian exploration area. He will be headquartered in Charleston, W. Va. **Charles F. Bassett,** zone regional geologist in the Tulsa production division, succeeds Frazier.

Henry J. Amend, a director and auditor of Sinclair Pipe Line Co., Independence, Kans., has been named vice chairman of the committee on pipeline accounting regulations of the American Petroleum Institute's Division of Transportation.

F. L. Nelson has been promoted by Stanolind Oil & Gas Co. from assistant division engineer to field superintendent in the Luby area, near Corpus Christi. Nelson is succeeded by **M. Scott Kraemer,** promoted from Houston district engineer. **Jack McWilliams,** former senior petroleum engineer, moves up to the Houston post.

Jack L. Stanford, district geologist for British American Oil Producing Co. in Billings, Mont., has been transferred to a new district office in Amarillo.

Dr. C. Gardley Moon has resigned as geologist with Humble Oil & Refining Co. to join the University of Oklahoma faculty as associate professor of geology.

Harrison B. Haney, a vice president of Tide Water Associated Oil Co. since 1948, has been named to manage all transportation activities, including marine and pipeline. Haney was western division transportation manager from 1936 to 1949.

D. E. Perriman, Shell Oil Co. exploitation engineer, has been transferred from Houston to C.A. Shell de Venezuela, Ltd., Maracaibo.

PERSONALS

Clarence G. Peterson has been moved up from dispatching manager to assistant superintendent of Shell Oil Co.'s Wilmington-Dominguez refinery. He replaces **R. H. Tubman,** who has been transferred to Shell's New York offices.

John C. Freeman has resigned as Panhandle and North Texas division geologist for Magnolia Petroleum Co., at Wichita Falls to join A. R. Dillard, Inc., there. Freeman had been with Magnolia 8 years, the last 5 as division geologist.

Robert J. Lantz has resigned as head of American Stratigraphic Co.'s Oklahoma City office to join Columbian Fuel Corp. as Oklahoma district geologist.

Frank M. Porter, New York, president of the American Petroleum Institute, and **Reid Brazell,** Alma, Mich., who heads Western Petroleum Refiners Association, have been honored by the Kansas Oil Men's Association "for their unselfish devotion to the American petroleum industry." Porter and Brazell were given bronze plaques at K.O.M.A.'s forty-first annual convention in Hutchinson, Kans.

Jack Strickland has been promoted by El Paso Natural Gas Co. from district superintendent at Farmington, N. M., to company headquarters in El Paso. He will head a newly formed industrial relations division. **Ed Alsup,** veteran of 17 years with El Paso Natural, succeeds Strickland.

Hugh Owen, former assistant to the Division II superintendent of Tennessee Gas Transmission Corp.'s pipeline department, has been moved up to manager of the Owensboro pipeline district.

Harry B. Copeland has been named to the newly formed position of crude-oil lines superintendent in Ohio Oil Co.'s Martinsville, Ill., pipeline district. Copeland has been assistant superintendent of pipeline communications at Martinsville since 1951.

Erwin E. Grimes has resigned as geologist with Houston Oil Co. to join Chessher, Sutton & Davis Drilling Co. as company geologist. Grimes will remain in Houston.

Edgar H. Clayton has been named vice president and general manager of Colombia Cities Service Petroleum Corp., with headquarters in Bogota. Clayton will direct development of the El Carare area. He will be assisted by **Zenas Stucky,** veteran geologist and past manager of exploration for Canada Cities Service Petroleum Corp. Operations will begin immediately.

J. J. Enkich, president and general manager of Genie Petroleum, Inc., has moved his headquarters from Chicago to Grand Junction, Colo.

R. C. Cashin has been promoted by Phillips Petroleum Co. from party chief at Big Lake, Tex., to geophysical supervisor at Bartlesville, Okla.

Fred E. Stickle, Great Bend, Kans., has been reelected president of Kansas Independent Oil and Gas association.

Robert L. Hershey has been promoted from assistant general manager to manager of the Du Pont Co.'s polychemicals department. He succeeds **Dr. Emil D. Ries,** who has retired after 25 years with the firm.

R. L. Redline has resigned as chief geologist for Great Western Drilling Co. to become a consultant in Midland, Tex. **Dewey Thornton,** assistant chief geologist for Great Western, has been made acting chief geologist.

P. N. JOHNSON

P. N. Johnson, Standard Oil Co. of California manufacturing executive, has been named president of Salt Lake Refining Co. and Salt Lake Pipe Line Co., both Socal subsidiaries. He succeeds **J. T. Higgins,** promoted to assistant general manager of manufacturing. Johnson, who joined Socal in 1939, also has served in the firm's production and engineering departments. Prior to a recent special assignment, he was superintendent of the El Segundo, Calif., refinery.

DEATHS

Herbert G. Wylie, 88, who immigrated from Ireland in 1887 with $20 in his pocket and later carved a fabulous career in early West Coast oil operations, died January 3 in Los Angeles. Wylie, a prominent philanthropist and Presbyterian layman, was best known as president of Mexican Petroleum Co. He had joined that company in 1902 after 6 years' pioneer drilling in the Los Angeles and Bakersfield areas. During Wylie's association with E. L. Doheny in Mexican, the firm's assets grew to more than $80 million. He also was credited with introducing oil as a fuel source for Pacific Coast railroads and ocean-going vessels. He had been retired 20 years.

H. F. Gibson, 60, partner with C. I. Holliman, Dallas, in Gibson & Holliman, drilling contractors, died January 8 in Tulsa. Gibson also was an independent producer and had been active since the early 1920's in southwestern oil operations.

William E. Pugh, research engineer for Seismograph Service Co. and authority on stratigraphic traps and organic reefs, died recently in Tulsa.

Joseph L. Comer, vice president of Wm. Powell Co., New York, died there recently.

Russell W. Bowers, 59, treasurer, operations manager, and a director of Sun Pipe Line Co., died January 7 in Moylan, Pa. Bowers also was treasurer of the Sun Pipe Line Co.'s of Michigan and Illinois, and assistant treasurer of Sun-Canadian Pipe Line Co., Ltd.

Ralph Herbert McLaughlin, 60, veteran Mid-Continent Pipe Line Co. executive, died January 6 in Tulsa. McLaughlin was manager of natural gasoline supply, right-of-way and claims, and land lease records for the firm.

Andrew Mackay Smith, 61, engineer for Kobe Oil Well Co., Los Angeles, died there January 2.

Elmore D. Jones, 75, pioneer tool supplier, died January 2 in his Long Beach, Calif., home. Jones in 1908 founded Midway Fishing Tool Co., Long Beach.

J. L. Murphy, 66, retired district superintendent for Panhandle Eastern Pipe Line Co. at Liberal, Kans., was found dead January 3 in a wrecked car near Mission, Kans.

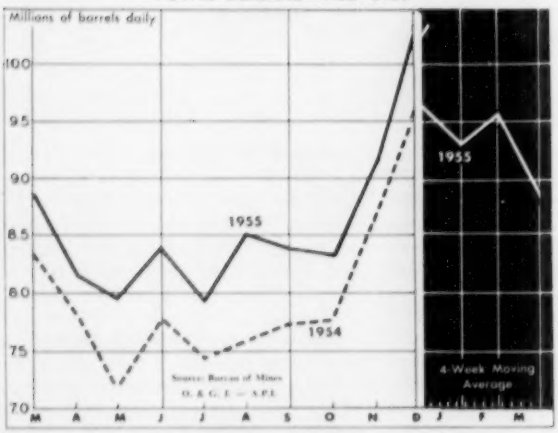
Carl P. Christensen, 44, foreman in Empire State Oil Co.'s Thermopolis, Wyo., refinery, died January 1.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,005,825	UP	46,525	UP	328,581
Crude stocks	262,033,000	UP	1,097,000	UP	547,000
Completions	1,154	UP	514	UP	123
Refinery runs	8,020,000	UP	113,000	UP	631,000
Gasoline stocks	169,012,000	UP	3,794,000	UP	8,056,000
Kerosine stocks	26,345,000	DOWN	1,092,000	DOWN	2,120,000
Distillate stocks	107,269,000	DOWN	5,523,000	UP	2,137,000
Residual stocks	39,719,000	DOWN	153,000	DOWN	12,346,000
Four-product stocks	342,345,000	DOWN	2,974,000	DOWN	4,273,000
Total imports	1,498,300	DOWN	39,600	UP	146,500

TOTAL DEMAND—ALL OILS



East Coast Distillate Prices Rise; Refinery Runs Set New Record

KEROSINE and distillate prices moved up on the East Coast while gasoline prices slipped in the latter part of the first week of the year.

Esso Standard Oil Co. raised kerosine and distillate-fuel prices in its marketing territory on the East Coast, effective January 6. The rise was met by other major suppliers as well as most independent marketers in the New York area.

Esso's increase amounted to 0.3 cent a gallon, bringing the New York Harbor barge price for kerosine to 10.85 cents per gallon and No. 2 fuel to 10.35 cents. The kerosine price in New York Harbor a year ago was 10.7 cents and No. 2 fuel was 9.95 cents.

Several gasoline suppliers in New Jersey reduced gasoline tank-wagon prices 1.0 cent per gallon in the first week of the year. Other suppliers met the reduction with voluntary allowances off posted tank-wagon prices.

Distillate prices are firm in the Mid-Continent, following the series of price increases during December. No. 2 fuel was up 0.75 cent from the last week of November to the first week of January. However, the low of the Group 3 quotations for No. 2 fuel still is only 0.125 cent higher than a year ago.

Gasoline movement out of Mid-Continent refineries has been good with no change in quoted prices.

On the Gulf Coast, light and heavy fuels are firm with some shading reported on the lower grades of gasoline.

Colder weather boosts distillate demand . . . Domestic demand for light heating oils reached a new all-time high in December. Total demand for distillates averaged about 2,750,000 bbl. daily during the month.

This high level of demand was due to a combination of more oil furnaces and colder weather. The North Central states and the upper part of the East Coast are the most important areas for consumption of home-heating oils. The weather this winter has been colder in both of these areas.

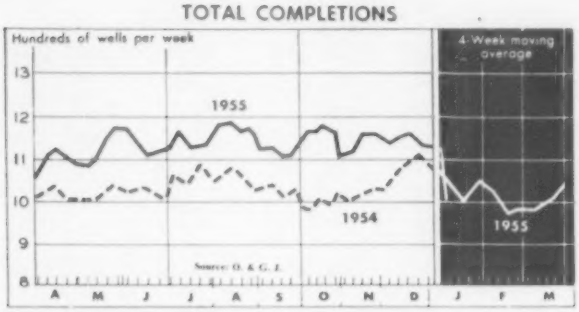
In the northeastern states, the weather so far this winter has been about 12.5 per cent colder than last winter. For the North Central states, the gain has been almost 15 per cent.

Refiners increase product output . . . Refinery runs set a new record in December, and if the report for the first week of the year is an indicator of January's operations, a new record is on the way. Crude runs averaged 8,020,000 bbl. daily for the week ended January 6. New records have been set each week for the past 3 weeks.

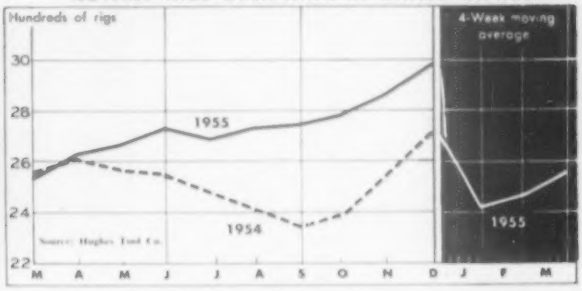
Total demand for all oils have averaged more than 10,000,000 bbl. daily for 5 out of the past 6 weeks. This high level of demand is expected to continue unless the weather turns warm in the last half of the month.

Tanker rates have dropped rapidly in the past 2 weeks. The rate on a fixture early in the second week of the year for Caribbean-North of Hatteras was USMC plus 5 per cent compared with USMC plus 150 per cent in December.

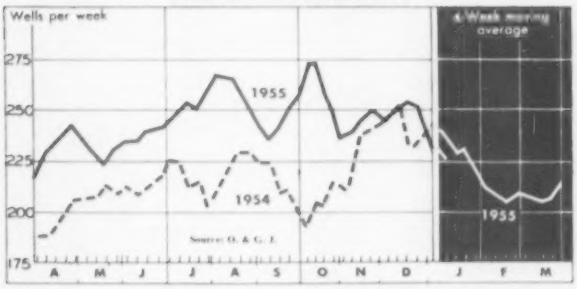
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	1-9-56	Change from 1-2-56	Change from 1-10-55
Gulf Coast	649	— 5	97
N. and W. Texas-New Mexico	924	—81	181
Arkansas-N. Louisiana-E. Texas	169	— 1	—15
Oklahoma	317	—13	38
Kansas-S. Nebraska	165	— 2	— 5
Illinois-Eastern	98	—11	—14
Rocky Mountain	236	—18	20
Pacific Coast	132	— 8	—19
Total United States	2,690	—139	283
Western Canada	196	2	12

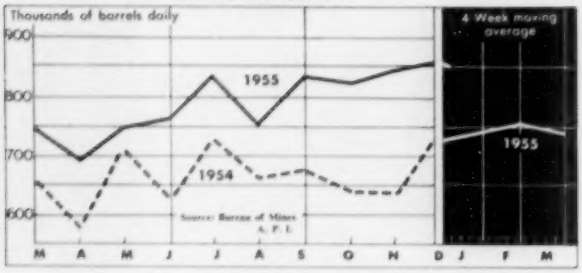
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 7, 1956

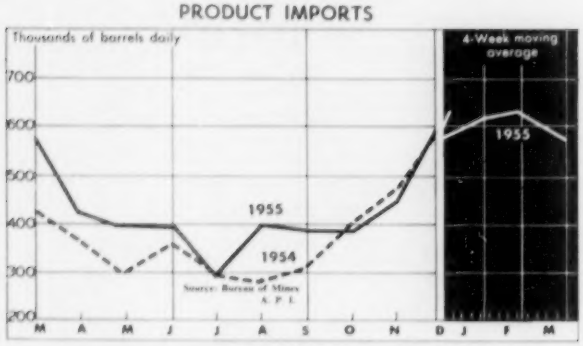
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1956	Cum. 1955	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1956: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	1	0	2	16,196	3	3	0	0	0	2	2	0	0	0	2	2
Arkansas	9	5	0	4	27,676	9	10	0	0	0	2	2	0	0	0	2	2
California	40	29	0	11	151,997	40	39	0	0	0	9	9	0	0	0	9	9
Colorado	26	2	2	22	140,776	26	27	0	0	1	12	13	0	0	1	12	13
Illinois	74	41	0	33	178,821	74	71	2	0	0	9	11	2	0	0	9	11
Indiana	10	2	0	8	11,701	10	21	0	0	0	5	5	0	0	0	5	5
Kansas	87	38	6	*43	332,686	87	145	2	0	0	19	21	2	0	0	19	21
Kentucky	19	8	4	7	28,734	19	43	0	0	0	6	6	0	0	0	6	6
Louisiana	97	46	9	42	804,288	97	60	1	2	0	12	15	1	2	0	12	15
North	23	4	6	13	92,591	23	29	0	0	0	3	3	0	0	0	3	3
South	74	42	3	29	711,697	74	31	1	2	0	9	12	1	2	0	9	12
Michigan	18	13	0	5	44,710	18	17	1	0	0	2	3	1	0	0	2	3
Mississippi	19	9	0	10	131,482	19	12	2	0	0	6	8	2	0	0	6	8
Montana	5	3	0	2	24,325	5	11	1	0	0	0	1	1	0	0	0	1
Nebraska	25	7	0	18	146,559	25	11	0	0	0	12	12	0	0	0	12	12
New Mexico	18	11	3	4	72,450	18	22	0	0	1	3	4	0	0	1	3	4
Northwest	3	0	2	1	15,865	3	2	0	0	1	1	2	0	0	1	1	2
Southeast	15	11	1	3	56,585	15	20	0	0	0	2	2	0	0	0	2	2
North Dakota	7	5	0	2	45,611	7	4	0	0	0	1	1	0	0	0	1	1
Ohio	24	12	4	8	51,328	24	14	0	0	0	0	0	0	0	0	0	0
Oklahoma	192	116	3	73	641,454	192	147	5	5	0	11	21	5	5	0	11	21
Pennsylvania-New York	5	0	5	0	23,713	5	36	0	0	1	0	1	0	0	1	0	1
Texas	455	271	15	169	2,115,886	455	323	25	3	4	112	144	25	3	4	112	144
Southwest (1 & 4)	92	54	4	34	428,725	92	47	11	1	1	23	36	11	1	1	23	36
Gulf Coast (2 & 3)	59	33	4	22	369,622	59	56	0	2	1	15	18	0	2	1	15	18
East (5 & 6)	30	7	5	18	150,020	30	10	0	0	0	11	11	0	0	0	11	11
North Central (7-B & 9)	134	73	0	61	403,587	134	117	8	0	0	31	39	8	0	0	31	39
West (7-C & 8)	128	92	2	34	727,919	128	85	6	0	2	32	40	6	0	2	32	40
Panhandle (10)	12	12	0	0	36,013	12	8	0	0	0	0	0	0	0	0	0	0
Utah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Virginia	10	1	9	0	21,098	10	6	0	0	0	0	0	0	0	0	0	0
Wyoming	11	5	1	5	38,365	11	9	1	0	1	4	6	1	0	1	4	6
Miscellaneous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total United States	**1,154**	625	61	468	5,049,856	1,154	1,031	40	10	8	227	**285**	40	10	8	227	285
Total previous week	640	324	65	251	2,526,830			15	0	7	106	128					
Total January 8, 1955	1,031	549	59	423	4,049,696			26	3	9	204	242	26	3	9	204	242
Western Canada	50	34	3	13	217,788												

Service wells included: *2, 11, 18.

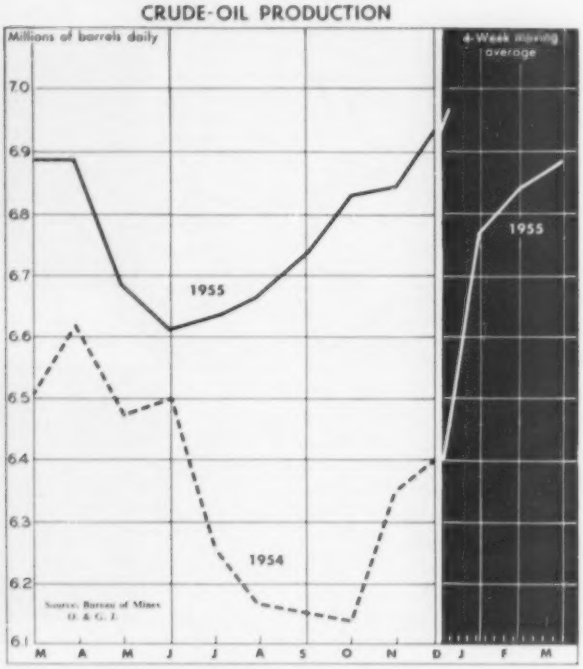
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

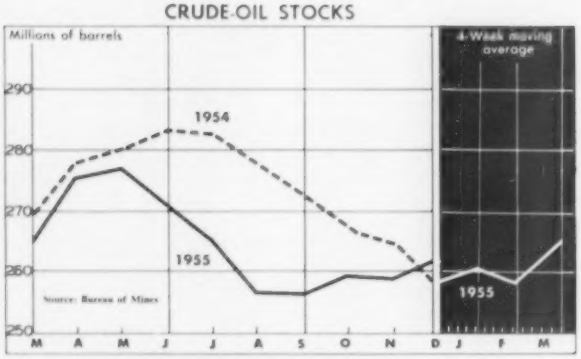


DAILY AVERAGE PRODUCTION FOR WEEK

	January 7			Dec. 31
	Crude oil	Lease condensate	Total	total
Alabama	4,300		4,300	4,200
Arkansas	73,700	500	74,200	73,950
California	978,800		978,800	978,600
Colorado	157,100		157,100	158,700
Eastern	49,500		49,500	50,000
Florida	1,400		1,400	1,350
Illinois	237,300		237,300	232,900
Indiana	31,400		31,400	30,000
Kansas	332,400		332,400	336,000
Kentucky	44,600		44,600	40,300
Louisiana	726,200	61,300	787,500	770,900
North	114,200	2,300	116,500	116,900
South	612,000	59,000	671,000	654,000
Michigan	29,800		29,800	30,800
Mississippi	106,000	5,350	111,350	112,350
Montana	37,900		37,900	38,700
Nebraska	28,200		28,200	28,100
New Mexico	227,800	3,900	231,700	227,950
North Dakota	35,100		35,100	32,300
Oklahoma	617,300		617,300	596,400
Texas	2,885,000	53,050	2,938,050	2,940,250
Dist. 1	48,000	650	48,650	56,600
Dist. 2	153,000	8,200	161,200	162,100
Dist. 3	428,000	25,000	453,000	439,200
Dist. 4	242,000	5,300	247,300	246,400
Dist. 5	46,000	550	46,550	49,525
Dist. 6	127,500	5,700	133,200	132,300
East Texas field	223,500		223,500	223,500
Dist. 7-B	150,000	50	150,050	150,050
Dist. 7-C	169,000	4,800	173,800	179,800
Dist. 8	1,010,000	2,000	1,012,000	994,000
Dist. 9	196,000	600	196,600	216,575
Dist. 10	92,000	200	92,200	90,200
Utah	4,900		4,900	4,750
Wyoming	272,600		272,600	270,600
Others	‡425		‡425	200
Total U. S.	6,881,725	124,100	**7,005,825**	6,959,300
Change from previous week, up			**46,525**	
Canada	†352,250		†352,250	408,050
Total U. S. production January 1-January 7				49,040,775 bbl.
Same period last year (crude plus cond.)				°46,831,036 bbl.

*Includes 789,425 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 300, Ariz. 25.

CRUDE-OIL STOCKS



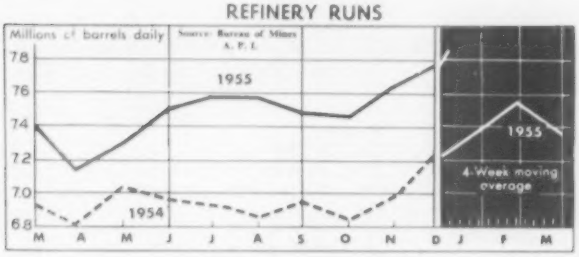
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

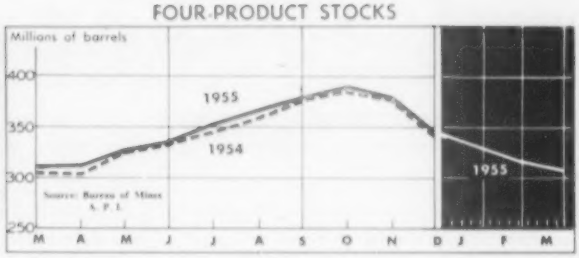
	12-31-55	12-24-55	1-1-55
Pennsylvania Grade	2,876	2,956	2,961
Other Appalachian	2,191	2,100	1,653
Illinois, Indiana, Michigan	9,440	9,219	11,800
Nebraska, North Dakota	2,093	1,978	1,721
Kansas	7,614	7,870	8,657
Oklahoma	22,066	22,126	25,204
Arkansas	2,086	2,407	3,278
Louisiana	15,971	16,176	14,428
North	2,505	2,563	2,383
South	13,466	13,613	12,045
Mississippi	2,786	2,814	2,897
New Mexico	7,599	7,634	8,166
Texas	124,235	123,903	118,564
East Texas proper	9,559	9,329	9,899
West Texas	59,027	58,486	52,830
Texas Gulf	24,447	24,527	23,258
Other Texas	31,202	31,561	32,577
Wyoming	15,430	15,231	13,980
Other Rocky Mountain	6,311	6,359	5,309
California	28,471	28,113	31,249
Foreign	†12,864	12,050	11,619
Total	262,033	260,936	261,486

*Bureau of Mines. †Includes 2,243,000 bbl. in California.

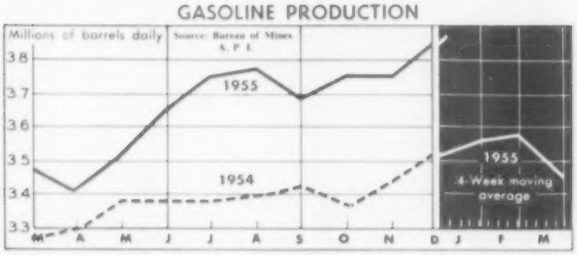
REFINERY RUNS



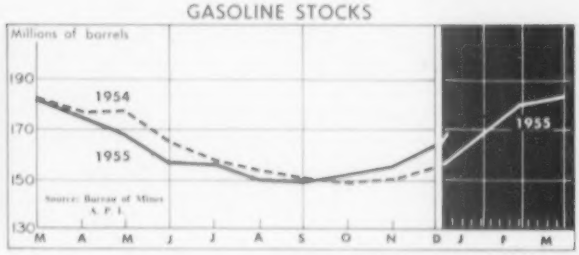
FOUR-PRODUCT STOCKS



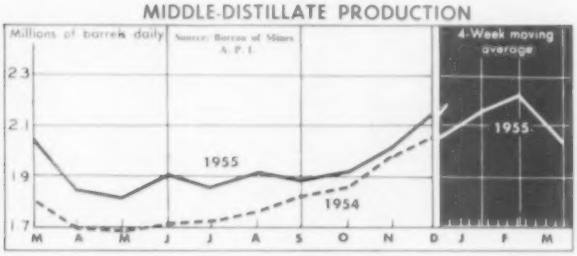
GASOLINE PRODUCTION



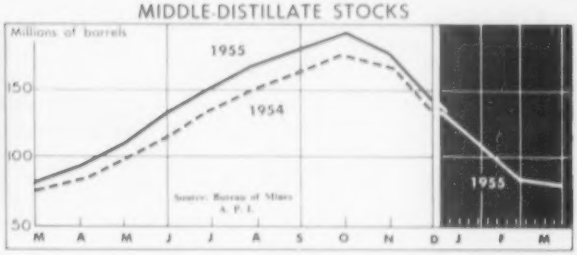
GASOLINE STOCKS



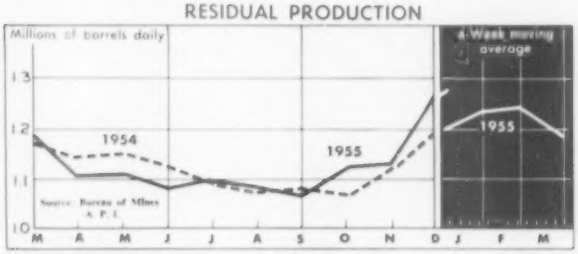
MIDDLE-DISTILLATE PRODUCTION



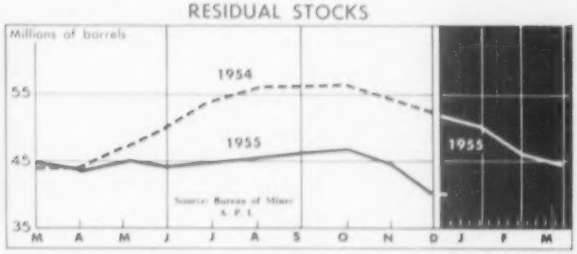
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JANUARY 6

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks† Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1955 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,120	491.1	26.4	315.7	253.4	37,710	10,899	39,241	11,765	1,151	454.5	40.7	313.5	234.7
Appalachian:														
District 1	104	42.6	5.7	26.1	9.7	4,474	608	2,163	461	104	43.1	6.3	24.6	8.6
District 2	106	52.4	7.1	24.3	18.6	2,481	391	791	283	92	43.7	7.9	15.2	15.3
Ind., Ill., Ky.	1,524	754.9	66.0	326.7	209.1	34,720	6,060	18,195	3,795	1,352	688.8	84.2	301.3	185.6
Okla., Kans., Mo.	770	444.1	24.9	203.9	36.9	17,905	1,318	11,312	1,329	678	393.0	17.3	159.3	50.5
Inland Texas	273	202.9	6.7	56.6	29.0	6,342	421	2,037	1,329	251	181.0	11.4	50.2	21.3
Texas Gulf Coast	1,938	909.0	140.9	529.8	257.6	22,684	3,073	12,584	6,672	1,798	814.5	148.0	487.2	235.0
La. Gulf Coast	675	333.9	53.7	159.9	38.9	9,547	2,144	5,549	1,178	622	298.8	70.2	142.4	51.0
N. La. and Ark.	92	36.0	9.7	25.4	7.7	4,105	779	2,027	63	95	35.7	9.7	19.6	7.0
Rocky Mountain:														
New Mexico	18	9.4		2.7	2.4	231	5	52	29	20	12.3	0.6	3.0	2.8
Other Rocky Mtn.	267	126.0	6.3	63.3	39.6	5,964	286	2,604	731	262	127.2	4.9	64.1	42.8
California	1,133	480.4	1.7	194.3	367.8	22,849	361	10,714	12,084	1,056	464.7	7.3	159.1	380.1
Jan. 6, 1956	8,020	3,882.7	349.1	1,928.7	1,270.7	169,012	26,345	107,269	39,719	7,481	3,557.3	408.5	1,739.5	1,234.7
Dec. 30, 1955	7,907	3,892.7	353.6	1,886.7	1,338.0§	165,218	27,437	112,792	39,872					
Jan. 7, 1955	7,389	3,627.4	406.3	1,777.7	1,268.0	160,956	28,465	105,132	52,065					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Revised.

Crude-oil and refinery prices at representative U. S. and foreign points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (86 octane)	11.00-11.25
Premium (94 octane)	12.50-12.75
Gulf Coast (Cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.25
Premium (97 octane)	13.00-13.25
New York (barges):	
Regular (89 octane)	12.25
Premium (96 octane)	14.50
California—Los Angeles (rack):	
Regular (84 octane)	13.10-13.15
Premium (93 octane)	14.10-15.10
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	6.00
Breckenridge:	
Grade 26-70	5.50

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.25
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	9.00-9.25
Distillate No. 2	8.75-9.00
New York Harbor (barges):	
★ Kerosine 41-43	10.85
★ Distillate No. 2	10.35
★ Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.75

WAX (I.B.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.10

★ Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.05-2.15
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.65
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined 0-10 p.p., 95 v.i.	23
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	19.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22-23
200 vis. neutral (180 at 100°), 25 p.t.	20

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.97				
15-15.9	2.03				
16-16.9	2.09				
17-17.9	2.15				
18-18.9	2.21				
19-19.9	2.27				
20-20.9	2.33	$2.50		$2.37	
21-21.9	2.39	2.52		2.39	
22-22.9	2.45	2.54		2.41	
23-23.9	2.51	2.56		2.43	
24-24.9	2.57	2.58	$2.91	2.45	
25-25.9	2.63	2.60	2.93	2.47	
26-26.9	2.69	2.62	2.95	2.49	
27-27.9	2.76	2.64	2.97	2.51	
28-28.9	2.83	2.66	2.99	2.53	
29-29.9	2.91	2.68	3.01	2.55	
30-30.9	2.97	2.70	3.03	2.57	
31-31.9	3.04	2.72	3.05	2.59	$2.46
32-32.9	3.12	2.74	3.07	2.61	2.48
33-33.9		2.76	3.09	2.63	2.50
34-34.9		2.78	3.11	2.65	2.52
35-35.9		2.80	3.13	3.67	2.54
36-36.9		2.82	3.15	2.69	2.56
37-37.9		2.84	3.17	2.71	2.58
38-38.9		2.86	3.19	2.73	2.60
39-39.9		2.88	3.21	2.75	2.62
40 and up		2.90	3.23	2.77	2.64

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas, and Wyoming (sweet). †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, October 17, 1955; east of California, June 15, 1953; Pennsylvania Grade, December 1, 1955.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	†3.85
Middle District	†3.72
Southwest Pennsylvania	†3.43
West Virginia	†3.31
Buckeye Grade	†3.25
Zanesville Grade	†2.92
†Effective December 1, 1955.	
Illinois Basin	3.00
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-48.9°, Tucupido	*$3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.92
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.39
Iraq, 36.0°-36.9°, Tripoli, Banias	2.39
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES (PER LONG TON)

(Latest reported spot fixture)

Gulf-New York, dirty (USMC+25%)	$3.56
NWI—U.S.N.H., dirty (USMC+5%)	2.84
NWI—U.K., clean (Scale+35%) (43s. 10d.)	6.16
Persian Gulf—U.K. (Scale+35%) (64s. 7d.)	9.06

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 23c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$16.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classifjed Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

100,000 FT. 8⅝ lap weld, A-1 second-hand, 28-lb., plain-end and threaded pipe. Dick Griffin, Box 2373, Tulsa, Phone HIckory 6-0848.

FOR SALE: Used R. L. Cardwell Drilling-in Unit. Splendid condition with all accessories and large Doghouse. Located near Wichita. Phone or write John Richard, McClelland Hotel, Wichita, Kansas; or write Box 361, Topeka, Kansas.

FOR SALE—Two Walker-Neer Model C-34 Spudders, Trailer mounted. Waukesha 145GKU Engines complete with all drilling in tools, doghouses, light plants, 7500 ft. ¾" drill lines, 7,000 ft. ⅝" sand line. Inventory on request. Box J-284, The Oil and Gas Journal, Tulsa, Oklahoma.

3500' ROTARY Wilson Super draw works. 145 H.P. Waukesha engine, 87' Pole mast stands, double 7¼x10 mud pump powered with Waukesha, 3000' of 3½" drill pipe complete every way. New in 1954. Sacrifice $33,000.00. Call Hughes, RIverside 2-8147 Nights.

LIQUIDATION
PHILLIPS REFINERY
POCATELLO, IDAHO

HOT OIL PUMPS
Worth. 12" KUF Diesel drive.
Nat. Tr. 4x12 HDOEP Duplex.
Worth. 9x5x10 Duplex.

TRANSFER PUMPS
Duplex from 4x3x4 to 10x7x12.

FURNACE TUBES
4-6% Chrome 1½ New Cost

TOWERS—COLUMNS
4'x59' 160 PSI 23 trays.
2'x47' 375 PSI 20 trays.
3'x49' 425 PSI 28 trays.
7'x54' 150 PSI 20 trays.
7'6"x41' 160 PSI Reactor.

FURNACES
Crude Oil 8 Million BTU.
Light Oil 10 Million BTU.

HEAT EXCHANGERS
94 to 550 sq. ft. Steel Tubes.
140 to 440 sq. ft. Adm. Tubes.

COMPRESSORS
1406 SCFM Gas Driven 250 PSI.
211 CFM Motor Drive 100 PSI.

ETHYL BLENDING PLANT
4200 gal. Tank, Scale & Building.

STORAGE TANKS
500 to 20,000 bbl. All Welded.

BOILERS
153 HP 160 PSI Water Tube (3).
250 HP 150 PSI Stirling.

WRITE FOR COMPLETE INVENTORY

AT OTHER LOCATIONS
25—Adm. Tube Cooling Section.
16—Tulsa Condensers.
2—100 HP 300 PSI Oil Field Boilers.
3—7'x24' Separators, 150 PSI.
13—Hor. Tanks 5,000 to 12,000 gal.
3—Steel Bldgs. 35'x190' & 25'x90'.

HEAT & POWER CO., INC.
60 East 42 Street, New York 17, N. Y. Murray Hill 7-5280
310 Thompson Bldg., Tulsa, Okla. Diamond 3-4890

FOR SALE EQUIPMENT

FOR SALE: 86' Oilwell Mast, with 4½ Substructure. Telephone: CE 2-6318, Oklahoma City, Okla.

FOR SALE—Near Ponca City, Oklahoma 16,000' 8⅝" OD 28# used line pipe suitable for casing or line pipe. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE—3 R. L. Cardwell Double Drum Spudders, each with a 4-legged mast and sub-structure. All in excellent condition. Priced to sell. Box 871, Seminole, Okla.

PIPE STANDARD

New Prime Electric Weld, Double Random Length, Plain End, Beveled for Welding.
4,000' 6⅝" O.D. 18.98# per ft.
2,000' 10¾" O.D. 22.88# per ft.
All sizes New Merchant Pipe, Black and Galvanized, ⅛" thru 4". Available for Immediate shipment.

RECONDITIONED WELL CASING
5,000' 4½" O.D. x 10#
9,000' 6⅝" O.D. x 13#
T & C 16-21' Random Length

RECONDITIONED STANDARD PIPE
66,000' 8⅝" O.D. x 28#
20,000' 12¾" O.D. x 50#
20' Random Lengths, Machine Cleaned, Straight, Beveled for Welding.

RECONDITIONED TUBES
10,000' 2" O.D.
10,000' 2½" O.D.
3,000' 3½" O.D.
10,000' 4" O.D.
5,500' 5⅝" O.D.
5,500' 5½" O.D.
Excellent for lines or irrigation purposes.

WRITE—WIRE—PHONE
Sonken-Galamba Corporation
2nd and Riverview (X-243)
Kansas City 16, Kansas ATwater 1-9305

FOR SALE EQUIPMENT

FOR SALE: 3400' of 3½" drill pipe, new sleeves, extra good. Telephone: CE 2-6318, Okla. City.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

SAVE MONEY
on
8" LINE PIPE
LAPWELD 8⅝" O.D. 28.55

Very good No. 1 grade, used pipe. Straight 20' single random lengths machine cleaned.

Choice of plain end or T&C. Ideal for oil, water and gas systems, 550 to 900 psi. Pipe located in Illinois, with low barge, rail and water rates to any part of the world. Priced below market, selling at almost ½ cost of equivalent new pipe. Will sell for cash or will finance meritorious propositions.

Brokers and agents protected.

REDNEB PIPE CO.
P. O. Box 1799 Shreveport, La.
Phone 4-7757—68

GASOLINE PLANT EQUIPMENT FOR SALE

3—800# 20 MMCF Absorbers with Scrubbers, etc.

1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.

Other equipment, Instruments, Pumps, Pipe, Valves and Fittings necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

Southern Production Company, Inc.
P. O. Box 670, Phone FAnnin 8103,
Fort Worth, Texas

Liquidating Oil Refinery

FORMER PURE OIL COMPANY REFINERY, CHARLESTON (CABIN CREEK) W. VIRGINIA
6,000 Bbl. Topping—3,000 Bbl. Thermal Cracking, 100 Bbl. Catalytic Polymerization—Lube Oil and Paraffin Wax Plant, Rerun Unit, 8500 Gal. Ethyl Plant, Boiler Plant, Tank Farm, Instruments—Complete Refinery Pipe, Valves, Fittings, etc.—Visit the plant—salesmen on premises.

Every item offered at a fraction of original cost. Detailed catalogue of major items mailed on request.

BROWN-STRAUSS CORPORATION

1546 Guinotte Ave. Phone HArrison 1000 Kansas City, Missouri

FIELD OFFICE
Cabin Creek (Suburb of Charleston) W. Virginia
Tel. East Bank 5611—Mail Address P. O. Box 2021
Roy Crisp—Manager—Charleston, West Virginia

ANOTHER BRILL LIQUIDATION!

FORMER LACY REFINERY

BIG SANDY, TEXAS

COMPLETE POLY UNIT, BUILT 1950 UOP RATED 144 BBL. DAY

Complete Perco unit built 1950, Phillips Petroleum rated 1400 bbl./day.
1—Wyatt 30" x 70' Stabilizer 160# 30 tray
3—Absorbers, 14" x 40', 20" x 50', 160#
2—Wash Towers, 18" x 25', 150#
1—Reactor, 24" x 28', 550#
1—Depropanizer, 20" x 35', 450#
1—Debutanizer, 12" x 26', 120#
3—Brinkman vertical tube furnaces 2, $1^1/_4$ mil. BTU/hr.
20—Brown fintube exchangers, 600# 140 sq. ft. 4-6 chrome.
20—Brown fintube exchangers, 600# 11, 21, 77, 101, 140 sq. ft.
5—Adm. Heat Exchangers, 644, 424, 346, 176 sq. ft.
2—Perco reactors 4500 gal., 8' x 12', 347 stls. st. 120#, 1000° F.
1—5' x 96' tower, 40 tray, 135# WP.
1—7' x 30' Propane tank, 250# WP.
1—10' x 50' Crude tower, 18 trays.
1—6' x 34' Vacuum tower, 150#.
1—2' x 50' tower, 24 trays.
3—Welded tanks, 10' x 40', 10' x 30', 5' x 20'
3—St. exchs., 2000, 1500, 480 sq. ft.
9—Oilfield boilers, 125 hp., 275#.
1—Ethyl lead plant.
3—Penn. comp. 8 x 11 x 9, 12 x $11^1/_2$ x 13, 10 x 6 x 11.
2—Convection furnaces, 4-6 ch tubing.
1—Vapor phase cracking furnace.
30—Welded storage tanks, 5000, 2000, 1000, 500 Bbl.
1—Waukesha anti-knock machine.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
30—Duplex piston pumps, all sizes.
1—10' x 30' asphalt still.
6—Steel Bldgs., 20 x 150, 12 x 20, 20 x 40, 20 x 20.
8—GR Fin Tube Exchangers, 248 sq. ft. 500 lb.
1—BS&B Oil & gas separator, 10.7 mcf, 3500 Bbl./day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

COMPRESSOR STATION—BALT., MD.

3—600 hp IR KVG Gas Comp.

EQUIPMENT ELSEWHERE

COLUMNS

7'6" x 55' 30 trays 45 lb.
8' x 75' 25 tray 40#
2' x 60' 35 tray 500#

HEAT EXCHANGERS

6—Adm. 785, 742, 425 sq. ft.
3—St. 2000, 785 sq. ft.
30—Atmospheric Bentube exch., stls and Adm. 715, 470 sq. ft.
30—304 SS shell & tube condensers 100-1000 sq. ft.

MISCELLANEOUS

Lab Petro-chem furnace 50,000 BTU/hr.
Gould 4" Pump 400 gpm 1600' hd.
B-J hot oil pump 3 x 9, 13 st, 325 gpm, 4620' hd.
Gould 16" pump 10,500 gpm, 135' hd.
800 ft. of 2" 4-6 ch pipe.
Large quantity of 410 SS chrome strips and sheets.
2 Worth. Centrifugal Pumps, 1500 gpm 50' hd.
1 BJ 8" Centrifugal Pump, 2000 gpm 115' hd.
1 BJ 2" Centrifugal Pump, 280 gpm 200' hd.
Tremendous selection stainless steel and steel valves $^1/_2$" - 6".

Partial List Only

WIRE PHONE WRITE

for Detailed Circular

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
Or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FAILING 1500 heavy duty drill with 4½ x 8 pump, automatic pulldown, and mounted on Ford truck. Write P. O. Box 619, Longmont, Colo. Phone 1333.

TWO CARDWELL Model R. L. Drilling units, both complete and in good condition. Both have 70-ft. masts; 5 and 6-in. tools; 6,000-ft. $^7/_8$-in. drilling line; 6,500-ft. $^5/_8$-in. sand line; $1^1/_2$ K.W. light plant; and steel tool houses. Triple E Drilling Co. Phone 1171 or 2464 Seminole.

ROD AND TUBING Machine in good condition. E. T. Franks Winch; 63 ft. mast with 2 and $2^1/_2$-in. tools. Complete set O'Bannon rod-fishing tools mounted on K.B. 7 International truck. Triple E Drilling Co.. Phone 1171 or 2464, Seminole.

WILSON SUPER double-drum, diesel powered, truck mounted, drilling rig complete ready to work, with C-100 Ideal Pump and 3600' $3^1/_2$" drill pipe. All allied equipment included. Inventory on request. W. H. Doran, Jr.—Box 648—Alice, Texas.

FOR SALE: National T-12 rig on 32' Tandem Trailer, 145 HP Motor, water cooled brakes, complete except drill pipe. First class condition. Box 91, South Houston, Texas.

COMPLETE ROTARY RIG, 2000 to 4500 feet capacity. 3500 feet $4^1/_2$" drill pipe, $7^1/_4$ x 14 pump, powered by 1335 Buda, and 350 H.P. V-8 Le Roi Engines. Price, $25,000. Phone DIamond 3-0369, Tulsa, Okla.

U-15 DRILLING RIG located in Ochiltree County, Texas. Will take supply house credit. Box J-316, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—36-L Bucyrus-Eirie Spudder complete with Tools & Equipment from 10" to 5". All in excellent condition. Ready to drill—Price $25,000.00. Call:—CHerry 2-2633, RIverside 2-4044, RIverside 2-4025, Tulsa, Okla.

8,089' NEW $4^1/_2$" OD 16.60# Grade D External Upset, Internal Flush Range 2—Youngstown Seamless Drill Pipe prepared for Hughes Seal Grip Joints. F.O.B. Great Bend and Chase, Kansas—$193.30 Hd. Ft. Colona Protectors, $1.90 per set. Full credit allowed on return. Buckeye Supply Co., 211 No. Broadway, Wichita, Kansas.

GARDNER-DENVER two-stage gas compressor unitized unit powered by 250 H.P. Buda motor and all equipment, gauges and coolers necessary to operate. All in first-class condition. Gulf Southwest Service Co., P. O. Box 1328, Shreveport, La. Telephone 2-8428.

New—7,980'—$2^7/_8$" OD A-4140 Seamless Drill Pipe AP 1-5A Grade with collars. ½ Price for quick sale. Contact

C. E. LETTS,
2714 W. Jefferson Ave.,
Detroit, Michigan.
Telephone TAshmoo 5-0345.

HELP WANTED

FOR SALE—At Bartlesville one Mayhew 1000 Rotary Shot Hole Drill, mounted on Ford $1^1/_2$ ton Coleman Drive unit with $4^1/_2$" x 6" pump and 22' mast. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

24L BUCYRUS-ERIE with Spudding Clutch, mounted on rubber. Buda butane-operated engine. Priced cheap for quick sale with or without tools. J. R. Dominick. II, c/o Traders National Bank, Kansas City, Mo.

3000' New 14" OD x ¼" wall Line Pipe
3400' New 16" OD x ¼" wall Line Pipe

Double random lengths—plain end—beveled—Electricweld.

CENTRAL PIPE & SUPPLY CO.,
Ph. SH 4-7404, Box 1466
Lubbock, Texas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

Stop Tong Breakage!

ARMITE DRILL COLLAR & TOOL JOINT COMPOUND

ARMITE LABS., 8608 Broad St., Los Angeles 1, Calif.
Petro. Industries Consultants, C.A. Caracas, Venez.

EQUIPMENT WANTED

MAYHEW 1000 with 5x6 Wheatley Pump and equipped for 15' drill rods. 750 gal. class water truck. Trucks should be of late model. TEXAS SEISMOGRAPH COMPANY, Box 2069, Wichita Falls, Texas.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

PROCESS ENGINEER—Chemical or Mechanical Engineer with exceptional individual initiative and 2 - 3 years experience in petroleum refining to assume position with Engineering Department of 20,000 barrel independent Refinery located in East Texas. Send complete resume: Box J-320, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS ENGINEERS

(Ages 25 - 38)

A major integrated U. S. oil company operating in South America has challenging career opportunities in an expanding organization for qualified natural gas engineers. Requirements include a degree in chemical engineering and 5 to 10 years of experience in gas and product recovery, gas process engineering, plant engineering and operation, design of gas plants and systems and economic evaluations. Salary and bonus approximately $12,500 - $17,000, depending on qualifications and experience. Liberal employee benefits and home vacations with travel expenses. Send complete personal data and experience resume. Interviews will be arranged for qualified candidates. All replies confidential.

Box 1221
Dept. F-21
New York 1, N. Y.

HELP WANTED

PETROLEUM ENGINEERS

(Ages 25 - 38)

Career opportunities for petroleum engineers with a major U. S. integrated oil company operating in South America. Position vacancies exist for reservoir and petroleum production engineers at levels requiring from five to eight years of pertinent experience. Candidates must have a degree in petroleum, mechanical or chemical engineering. Excellent growth opportunities in an expanding organization. Salary, including bonus, $12,500 - $15,000, depending on qualifications and experience. Liberal employee benefits and home vacations with travel expenses. Send complete resume of education, personal data and work experience. Interviews will be arranged for qualified candidates. All replies confidential.

Box 1221
Dept. Y-21
New York 1, N. Y.

HELP WANTED

GAS CONTRACTS MAN—Large mid-continent integrated oil company needs gas sales and contract man with at least 5 years experience in marketing natural gas. Must be experienced in negotiating gas sales contracts and be familiar with potential gas markets in mid-continent and Gulf coast areas. Location, Tulsa, Oklahoma. Our employees know of this ad. Submit experience, qualifications, education, age, and minimum salary requirements to Box J-305, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Active independent oil company has vacancies for graduate petroleum engineers with two to five years of practical experience in drilling and production in West, West Central or North Texas. Excellent opportunities for growth and advancement. Replies should furnish complete personal data, education, experience, and starting salary desired.

BOX J-300,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

PETROLEUM ENGINEERS

Experienced graduate engineers for immediate openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

SUPERVISORY PETROLEUM ENGINEER

For responsible staff position in Saudi Arabia, directing the work of experienced engineers making Petroleum Reservoir Studies. Advise management on Petroleum Reservoir Engineering problems.

Salaries commensurate with training and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN-AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

GEOLOGIST with B.S. or M.S. in Geology or Geological Engineering. Age 25 to 30 with a minimum of three years experience as Petroleum Geologist with preferable experience in the Ark-La-Tex district. Outline education and experience. Murphy Corporation, Attn.: Glenn M. Fedderson, Murphy Building, El Dorado, Arkansas.

General Refinery Superintendent

General refinery superintendent wanted for new refinery in South America having crude, vacuum, and cat cracking facilities. Position will involve knowledge and experience of all phases from terminal management through refining management and direction of all offsite facilities. Only most experienced men having had supervisory experience and who have outstanding qualifications and proved records will be considered.

Box J-325,
The Oil and Gas Journal,
Tulsa, Oklahoma.

Qualified Petroleum Engineers

Drilling Engineers

Production and Reservoir Engineers

Positions open in Arabia. Require petroleum engineering degree from recognized school and suitable experience. One year contract. Excellent benefits. Salary commensurate with experience. Apply in writing, furnishing full description of qualifications and experience to:

AMERICAN INDEPENDENT OIL CO.,
111 Sutter Street,
San Francisco, Calif.

All replies will be held confidential.

DRILLING REPRESENTATIVE

Major drilling company has opening around February 1 for contact and public relations man in Permian Basin, between ages of 30 and 40. Must be well acquainted with oil fraternity in Basin and have good personality. Must be able to furnish excellent references, past employment record and educational background. Good position for right party.

Box J-324,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

PETROLEUM ENGINEER

A large Engineering and Construction Co. now building a very large Oil Refinery on the East Coast desires an Engineering Graduate with at least 5 years' oil refinery supervisory operating experience. This engineer is to assist construction crews in coordination of job completion.

Submit resume and salary requirements to

BOX J-302,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

ENGINEERS

Major Oil Company has openings in drilling, production & pipe line departments in Venezuela for graduate petroleum, mechanical & civil engineers. Salary commensurate with experience. Please send details of experience to:

P. O. BOX #35
BOWLING GREEN STATION
NEW YORK 4, NEW YORK

PETROLEUM ENGINEER

Major Midwest Bank

has opening for man experienced in valuation of oil and gas reserves. In reply please give resume of experience and salary expected. All replies held confidential.

Box J-275,
The Oil and Gas Journal,
Tulsa, Oklahoma.

MECHANICAL ENGINEERS

Employment Opportunities in SOUTH AMERICA

Attractive staff positions available with affiliates of STANDARD OIL COMPANY (N. J.). Must be thoroughly qualified and experienced in design and/or maintenance of refinery or chemical plant equipment including piping, pressure vessels, heat exchangers.

Attractive salaries, liberal annuity and savings program offered.

Write, giving age, marital status, education and details of previous experience.

Box 308-D
RADIO CITY STATION
New York 19, N. Y.

HELP WANTED

EQUIPMENT INSPECTORS

(Ages 25 - 32)

Career employment opportunities with a major integrated U. S. oil company operating in South America. Vacancies exist in refinery equipment inspection positions at levels requiring two to four years of refinery equipment inspection experience. Candidates must be graduate engineers, preferably mechanical or metallurgical. Salary, including bonus, $11,000 - $12,500, depending on qualifications and experience. Liberal employee benefits and home vacations with travel expenses. Send complete resume of education, personal data and work experience. Interviews will be arranged for qualified candidates. All replies confidential.

Box 1221
Dept. Q-21
New York 1, N. Y.

STANDARDS ENGINEER

Attractive opening in Esso Engineering for a Standards Engineer. Will work with a group of engineers preparing engineering standards and standard purchase specifications for oil refinery equipment.

Candidates should be graduate engineers not over 35 years of age. Broad background of at least five years experience with oil refinery equipment desired.

Give full and specific details of education, experience, desired salary, availability date and references.

All inquiries will be considered promptly and held confidential.

Esso Research and Engineering Company

(Formerly Standard Oil Development Company)

Personnel Division

P. O. BOX 51 LINDEN, N. J.

SITUATIONS WANTED

PETROLEUM ENGINEER, age 32, with 6½ years varied Ark-La-Tex field experience desires position with future. Consider any location. Box J-321, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION GEOLOGIST. Fifteen years' experience in various phases of oil business in the United States, Canada, South America. Currently senior geologist with major company in South America. Desires connection with future, with organization having active development program. Foreign or domestic. Geologist or Petroleum Engineer. Box J-304, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

SITUATIONS WANTED

SEISMOGRAPH Supervisor over twenty years wide areal experience all phases operations and interpretation, employed, seeking situation with greater permanency, major oil company or stable independent. Box J-322, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION or Research Geologist, Masters Degree, six years varied major company experience. Box J-319, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, seven years major company experience, Louisiana, Mississippi and East Texas, desires employment in one of these areas. Preferable with small company or independent. Box J-318, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—33, employed, registered, 9 years with major. Desires position having advancement opportunities with small major, independent, or consulting partnership. Box J-317, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST-GEOLOGIST: 8 years experience, major, South Louisiana, good references. Desires responsible position, Lafayette or New Orleans. Box J-315, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Eight years West Texas, New Mexico exploration, exploitation and geophysical experience. Desire employment with Independent. Now in responsible position with Major. Box J-313, The Oil and Gas Journal, Tulsa, Oklahoma.

WESTERN CANADA

GAS
PRODUCTION, PROCESSING, MARKETING

EXECUTIVE GAS ENGINEER, 10 years excellent experience in gas production, processing, marketing; design, construction, operation of gasoline plants; thoroughly familiar with Western Canadian gas situation. Desires affiliation with sound U.S. or Canadian company established in or planning to enter Western Canada, to organize and manage gas division or entire operation. Now employed in executive position, contemplating change for advancement opportunities.

Box J-323, The Oil and Gas Journal, Tulsa, Oklahoma.

LOGS

SITUATIONS WANTED

MAINTEANCE ENGINEER—B.S. degree in C.E. presently employed with major oil company in South America. Desires change to other company foreign or domestic. Experienced in F.C.C.U., as well as other refinery plants. Capable of planning and executing all maintenance and new construction. Capable design engineer. Box J-314 The Oil and Gas Journal, Tulsa, Oklahoma

PRODUCTION

200 BARRELS DAILY. Have approximately 200 barrels settled production Creek, Payne, Lincoln County, Oklahoma for sale immediately. Have net interest 20 wells under total 35. Income approx. $15,000.00 monthly gross. References please. Box J-301, The Oil and Gas Journal, Tulsa, Oklahoma.

SERVICES

ASPHALT CONSULTANT

Professional service in asphalt refinery operations; paving and roofing asphalts; project research. Emulsions, specialties. Soils. Problems in applied rheology. Plastics.

FORMULATIONS—APPLICATIONS
HIGHWAY ENGINEERING
EDWIN J. BARTH
54 West Street, Northampton, Mass.

BUSINESS OPPORTUNITIES

Am interested in leases or blocks for drilling purposes if information will justify. Depth preferred from 1000 to 4000 ft. Also good royalty.

Write or Call
R. E. (BUCK) CLEMENT
Box 65—Ph. 26 or 84
Norman, Oklahoma.

Sand Pump— Oil Field Equipment

For Sale: outright or royalty basis, internationally known sand pumps, release machines, pumping units, machinery, and supplies. Contact

Superior Manufacturing Co.,
G. W. Miller, President, Patentee of Superior Sand Pumps, also patentee, former Miller Sand Pump.
525 So. Oklahoma, Sapulpa, Okla.

Petroleum Service Management Company, Inc.

Consulting Engineers and Geologists

Research, Evaluations, Bank Loan Reports, Investigations, Reports for Underwriting Issues, Well Supervision, Property Management, Contract Leasing, Drilling Deal Recommendations, Purchase of Proven Oil and Gas Properties. Complete management and supervision, U.S.A.-Foreign Refinery Design, Construction and Management. We handle all of your operations on straight retainer and management fee basis, or participating and retainer basis. 306 Commerce Building, Box 1992, Abilene, Texas. Phone 2-9621.

LOGS

LOG FILE ON GRAYSON COUNTY, TEXAS

756 ELECTRIC LOGS — $800.00
61 SAMPLE LOGS — $100.00

Logs on all wildcat wells and numerous field wells up to September, 1955. Elevations, drill stem tests, completion data, etc., recorded on logs. Stratigraphy and correlation points checked on most of the logs. We will furnish a list of logs on request.

FAIN & McGAHA
607 Hamilton Building—Wichita Falls, Texas.

ROYALTIES

OFFERING CHOICE PRODUCING oil and gas income royalties with large reserves per Dollar investments. A. S. Berry, P. O. Box 1383, Tulsa, Okla.

LEASE AND DRILLING BLOCKS

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Production.

160 A. OIL LEASE, eastern Utah, center of activity, near gas. R. Barnsley, 950 Lincoln Ave., Palo Alto, Calif.

OWN 460 ACRES in South eastern Kansas. Want someone to drill. E. A. Tanquary, P. O. Box 97, Stanley, Kansas. Phone Olathe 2146W4.

WE OFFER FOR SALE or operating contract two groups of mining properties located in Arizona in excellent winter operating area. On one 600 acre block we are stockpiling copper-gold-silver ore from extensive deposit for delivery to smelter, and doing exploration work on vast titanium deposit of almost limitless quantity. All open pit mining. On another 800 acre block 20 miles away, development work is underway on high quality deposits of rare earth minerals including uranium, cerium, bismuth, columbium, tantalum, neodymium and abrasive feldspar, as well as Sericite and flake mica deposits. Long range economic potential so great it dwarfs normal calculations. Do not reply if not able to spend $100,000.00 or more on first year's operations. For further details address owners at P. O. Box 1235, Amarillo, Texas.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

WANTED

WANTED: Producing royalties. Send report and full information to: C. A. Awalt, 511 Century Building, Fort Worth, Texas.

OIL PROPERTIES WANTED. "Oil properties wanted, settled or semi-settled production of 100 to 2,500 barrels daily in Oklahoma and Kansas. Property must stand thorough inspection. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma with particulars.

FARMS AND RANCHES

VIRGINIA ESTATE

Looking for a farm near Washington, with redecorated 12-room home and every convenience? Orange County Hunt has met on my place for years, and there are foxes galore. Only fifty miles from Washington on side road in Bull Run Mountains near Middleburg. 340 acres, in whole or part, with or without house. Sale by owner.

Box J-299, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL

U.S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Salt Lake City, Utah, December 29, 1955. Notice is hereby given that approximately 228 acres of land in lots 1, 2, E½ NW¼ Sec. 17; lots 1, 2, 3, 4 Sec. 18, T. 14 S., R. 7 E., S.L.M., Utah, within the known geologic structure of Clear Creek Field, undefined, in Carbon and Emery Counties, Utah, will be offered in one parcel for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 p.m., M.S.T., January 23, 1956, when bids will be opened. Details of the lease offering, how and where to submit bids may be obtained from the Bureau's Land Office, Post Office Box 777, Salt Lake City 10, Utah. E. E. House, Manager.

ADVERTISERS IN THIS ISSUE

Aero Design and Engineering Company 165
Ajax Iron Works 25
Allen-Bradley Co. 7
Allis-Chalmers Mfg. Co. 131
American Iron & Machine Works Co. 47
Anchor Petroleum Company 62
B and W Inc. 55
BJ Service, Inc., Subsidiary of Borg-Warner Corp. 157
Baird Mfg. Co. 161
Baker Oil Tools, Inc. 60
Bendix Aviation Corporation 159
Bethlehem Steel Co. 108
Black, Sivalls & Bryson, Inc. 28
Bonney Forge & Tool Works 147
Bower Roller Bearing Company 163
Bristol Company, The 40
Caran Bros. Engineering Co. 160
Carbide and Carbon Chemicals Company, A Division of Union Carbide and Carbon Corporation 16
Caterpillar Tractor Co. 85
Champion Spark Plug Company 30
Chrysler Corporation—Dodge Division 12
Clark Bros. Co. One of the Dresser Industries 14, 15
Classified Advertising 179, 180, 181, 182
Columbia-Southern Chemical Corporation, Subsidiary of Pittsburgh Plate Glass Company 13
Crose Manufacturing Co., Inc., M. J. 114
Curtin & Co., W. H. 52
Dow Chemical Company, The 132
Dowell Incorporated 79, 136
Drilling & Service, Inc. 169
Edward Valves, Inc. 57
Emsco Manufacturing Company 54
First National Bank of Shreveport, The 52
Foster Wheeler Corporation 46
Gaso Pump & Burner Mfg. Co. 51
General American Transportation Corporation 81
Grancell, I. H. 129
Grove Valve and Regulator Company 8
Guiberson Corporation 150
H & M Pipe Beveling Machine Co. 141
Halliburton Oil Well Cementing Co. 17, 58
Helicoid Gage Division, American Chain & Cable Co. 158
Houston Contracting Company 135
Hughes Tool Co. Back Cover
Inferno Co., The 144, 160
Janette Electric Mfg. Co. 10, 11
Johnston Testers, Inc. 34
Jones & Laughlin Steel Corporation Supply Division 36
Kenyon & Sons, Ltd., William 138
Lane-Wells Company Inside Front Cover
Larkin Packer Company, Inc. 142
Linde Air Products Company, A Division of Union Carbide and Carbon Corp. 33
Macco Oil Tool Co. 144
Macwhyte Co. 5
Magnet Cove Barium Corp. 107
Manning, Maxwell & Moore, Inc. 38
Mayo Hotel, The 145
Mid-Continent Supply Company 31
Miller Sand Pump Co. 160
Mission Mfg. Company 166, 167
Mutual Chemical Division Allied Chemical & Dye Corporation 143
National Airoil Burner Co., The 144
National Aluminate Corp. 77
National Supply Co., The 21, 22, 23, 24
National Tank Company 184
Nicolet Industries, Inc. 48
Norris Manufacturer, Inc., W. C. 4
Oil Center Tool Co. 139
Oil Well Supply Division 6
OPW Corporation 19
Otis Pressure Control, Inc. 130
Pacific Car and Foundry Company 49
Parkersburg Rig & Reel Co. 18
Parsons Company, The Ralph M. 122
Peerless Supply Co. Inc. 160
Penrod Drilling Company 9
Petreco A Division of Petrolite Corporation 20
Petroleum Electric Power Assn. 126
Pittsburgh Coke & Chemical Co. 39
Pittsburgh Steel Company 44, 45
Reda Pump Company 55
Refinery Supply Co., The 52
Rockwood Sprinkler Company 35
Ross Heat Exchanger Division of American-Standard 170
Schlumberger Well Surveying Corp. 41
Second National Bank of Houston 168
Southwest Industries, Inc. 56
Tapecoat Company, The 53
Taylor Forge & Pipe Works 26, 27
Templeton, Kenly & Co. 129
Texas Company, The 42
Thornhill-Craver Co. 110
Tube Turns, Inc. 29
Tulsa Crating Co. 145
Union Carbide and Carbon Corporation, Carbide and Carbon Chemicals Company 16
Linde Air Products Company 33
United States Rubber Company 43
United States Steel Corporation—Oil Well Supply Division 6
Vapor Recovery Systems Co., The 50
Vogt Machine Co., Henry 32
Warner Lewis Company 37
Well Equipment Mfg. Corp. 155
WF Steel Products Inc. 146
Williamson, Inc., T. D. 134
Wilson Manufacturing Co., Inc. 125
W-K-M Manufacturing Company, Inc., A Subsidiary of ACF Industries Incorporated 128
Worthington Corporation 48
Youngstown Sheet and Tube Company Inside Back Cover

National Supply Opens Morgan City Store

National Supply Co. has opened an oil-field supply store at Morgan City, La., to serve drillers and oil producers in the surrounding area. Donald J. Arceneaux has been appointed manager of the store. It is under the supervision of L. A. J. Monroe, manager of the New Orleans district.

National's store, which will serve St. Mary, St. Martin, and Terrebonne parishes, will be its eighth in Louisiana. The company also has stores at Harvey, Houma, Jennings, Lake Charles, New Iberia, Opelousas, and Shreveport.

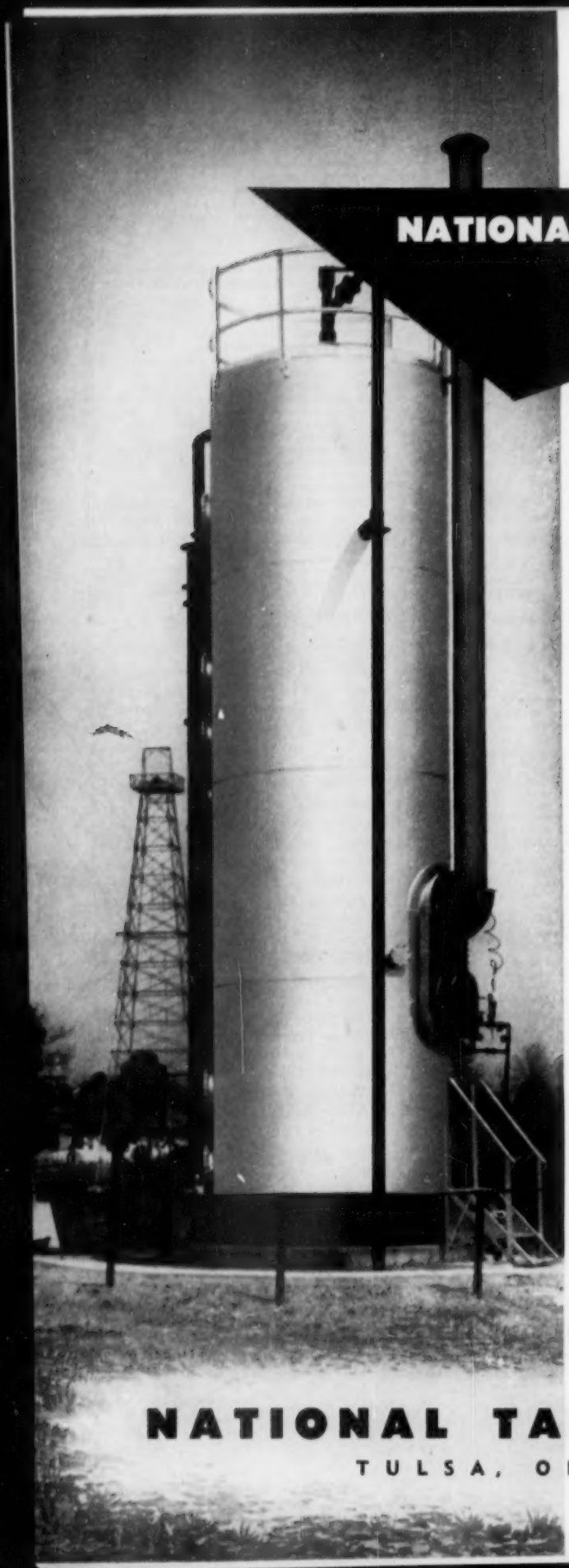
Alten Names Kessinger to Rocky Mountain Area

The appointment of Charles W. Kessinger as representative in the Rocky Mountain territory with headquarters at Denver, Colo., has been announced by Warren M. Benson, vice president of Alten Foundry & Machine Works, Inc.

Kessinger is an experienced oil-field man formerly associated with Rowan Drilling Co. and Bethlehem Supply Co.

LEGAL

SEALED BIDS will be received until 2:00 P.M., Mountain Standard Time, January 24, 1956 and opened at that time in the Office of the Uintah and Ouray Indian Agency, Fort Duchesne, Utah, for the leasing of 64,276.07 acres of Tribal land and 1,196.52 acres of Reserved land in 27 separate parcels, located in Townships 1 and 2 North, Ranges 1 East and 1, 2, 3 and 4 West, Uintah Special Base and Meridian, Survey, Uintah and Duchesne Counties, Utah, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to Mr. John O. Crow, Superintendent of the Uintah and Ouray Agency, Fort Duchesne, Utah or to the office of the Regional Oil and Gas Supervisor, U. S. Geological Survey, Casper, Wyoming.



NATIONAL ICP TREATER . . .

SAVES
$731.64 PER MONTH

Inter-Office Correspondence

To: [redacted] Date: April [redacted]

Subject: National ICP Treater
installed on our [redacted] Lease.

Dear Bud:

We thought you might be interested to know of the results obtained from the installation of the ICP Treater on our [redacted] Lease last September.

In figuring the amount of gas purchased for this lease, taking months comparable in weather conditions, six months before and six months after the installation, we find that in the preceding six months we bought gas in the amount of $1,289.99 and in the succeeding six months we purchased gas in the amount of $599.47 a total saving for six months of approximately $699.47 or $133.00 per month.

Before installing this Treater it was necessary that we clean ten tanks per month, losing approximately twenty barrels of oil each time. This would amount to 200 barrels per month or approximately $486.00 per month. This Treater has now been in service approximately eight months and we have not cleaned a single tank.

In addition to the gas and tank cleaning saving we also raised the gravity of the oil an average of 1°, which raised the price of the oil .02¢ per barrel. As this lease averaged 5,632 barrels of oil per month after installation of the Treater, the amount gained on raising the gravity amounted to $112.64 per month.

We figure the total savings as follows:

$133.00 per month saving on gas.
$486.00 worth of oil saved each month.
$112.64 more per month for increased gravity.
$731.64 Total saving each month.

The first six months after installing this Treater we had saved $4,395.84. As the Treater cost $3,439.26, at the expiration of six months the Treater was paid for with $956.58 left over as profit.

Respectfully yours,

[redacted]

It's a National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

Chandler Markell
Tulsa, Oklahoma

Robt. K. Little
Midland, Texas

Lloyd A. Brudvig
Casper, Wyoming

These men are ready to serve you . . .

W. G. Kingelin
Bellaire, Texas

W. A. Shoenberger
Shreveport, La.

IN THE OIL COUNTRY

Nothing can beat "on the spot" service, particularly when you know it is specialized. These men are Youngstown Field Engineers—specialists in Oil Country Tubular Goods and drilling operations.

Strategically located to best serve the oil fields, they actually live with your problems.

Their job is to help you secure all the advantages built into Youngstown Oil Country Tubular Goods.

When you need tubular engineering service contact your nearest Youngstown Sales Office.

You'll find Youngstown's Field Engineering Service as near as your telephone.

YOUNGSTOWN DRILL PIPE
MADE FOR OIL MEN BY PIPE MEN

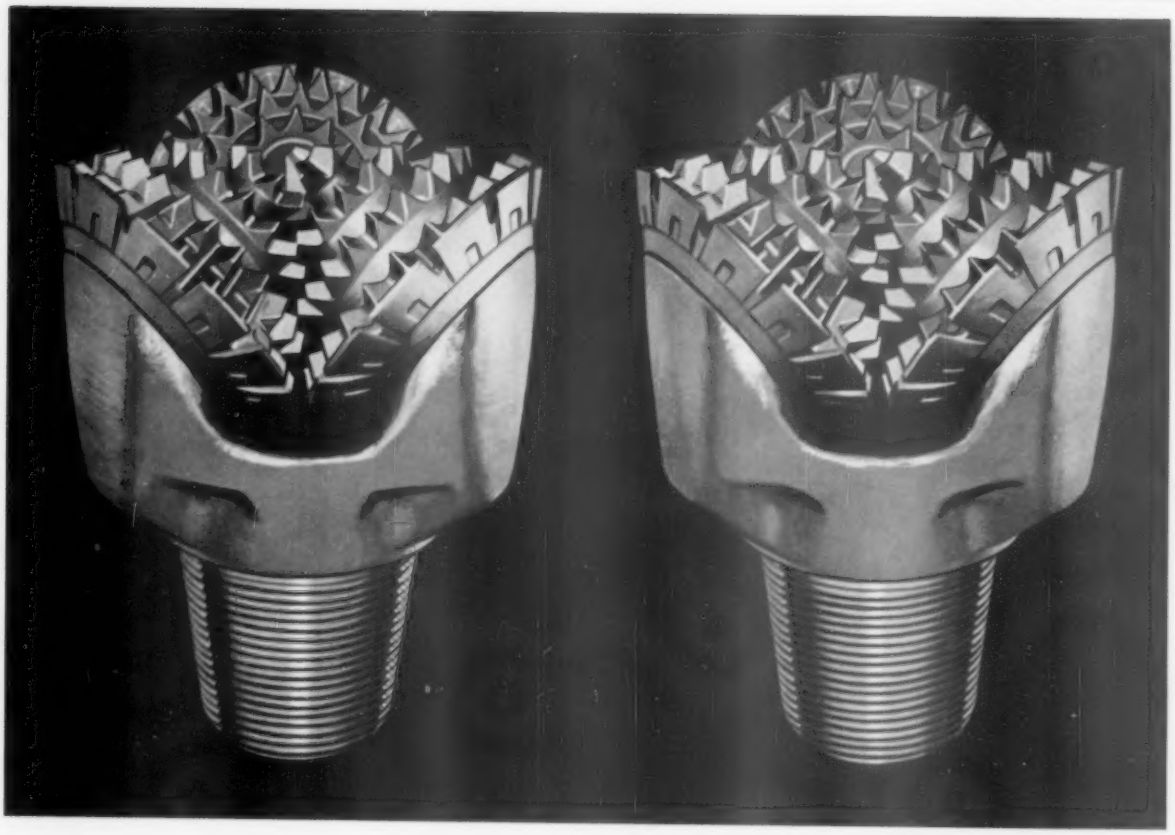
QUALITY YOUNGSTOWN SERVICE

Youngstown DRILL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS



THEY LOOK ALIKE ... but

Because bits look alike is no certainty they will perform alike. Take the case of the two bits shown here.

There is a metallurgical improvement in the second bit that was not present in the first. This combined with design changes gives the bit greater stamina and assures *more hours on bottom ... making more hole!*

This is another example of the constant changes being made by HUGHES to enable operators to take full advantage of new drilling techniques.